DUKANE

Intelligent Assembly Solutions

iQ Series

ULTRASONIC GENERATOR/POWER SUPPLY

ES

AUTOMATED HAND PROBE PRESS

User's Manual

Dukane Part No. 403-575-00

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Dukane ultrasonic equipment is manufactured under one or more of the following U.S. Patents:
(* = Inactive)
3,780,926 * 4,131,505* 4,277,710* 5,798,599 5,880,580 6,984,921 7,225,965 7,475,801 and, 7,819,158

Revision History

Revision Number	Revision Summary	Date
- 00	Original release.	08/19/2011

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Contents

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Contents *Continued*

SECTION 1

Introduction

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General User Information

Read This Manual First

Before operating your ultrasonic system, read this User's Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this equipment. The examples given are chosen for their simplicity to illustrate basic operation concepts.

This manual provides information to set up, operate, and interface this generator/power supply as an integral part of Dukane's ***iQ Series*** ES press system.

Particular models are listed in Section 10 - *Specifications*.

Notes, Cautions and Warnings

Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They represent increasing levels of important information. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or a operator protection issue.

Drawings and Tables

The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. –1, –2, –3) while the tables use roman sequence numerals (e.g. –I, –II, –III). As an example, Figure 3–2 would be the second illustration in section three while Table 3–II would be the second table in section three.

NOTE

Note statements provide additional information or highlight procedures.

CAUTION

Caution statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING

Warning statements point out conditions or practices that could result in personal injury or loss of life.

Condition or Practice

Electrical Safety Issue

Operator Protection (hearing)

Press System Overview

An ***iQ Series*** Ultrasonic Press System ES consists of these components: the ***iQ*** generator, press (with thruster, switches, controls, cables, transducer, booster, horn, and fixture) and ***iQ Explorer*** software. The software allows the operator to control the system either remotely or at the press location.

The ***iQ Series ES*** generator has rugged internal ultrasonic circuitry and ensures a continuous resonant frequency lock at the start of each weld.

The generator's compact size allows multiple units to be placed into an industrial equipment cabinet. This generator will operate at the same international line voltage input specifications as the other generators of this product family (unless the 120V option is installed). It also includes an RFI line filter that passes FCC and strict CE test specifications for global applications.

Key Generator Features

- **Digital Control** of all power supply functions, including digital frequency synthesis, and parameters allows for unique configurations and allows for future upgrades.
- **Process Parameters** such as frequency, amplitude and power are all updated at a 0.5 ms rate.
- **Pulse Width Modulation** incorporates patented circuitry giving the power supply the ability to efficiently change the output amplitude. This makes it possible to start large horns with reduced power. It also provides more power-efficient switch-mode generator operation and increased reliability.
- **Linear Ramp Soft-Start** circuitry allows the acoustic stack to be brought to operating amplitude smoothly, minimizing start-up surges and abnormal stress to the stack and generator.
- **Digi-Trac Tuning** tracks the resonant frequency of the acoustic stack (horn, booster, transducer) and adjusts the generator output frequency to match it. This is done for every weld cycle and eliminates the need to manually tune the generator.
- **Line Voltage Regulation** automatically maintains constant amplitude regardless of line voltage deviation. The available output power is maintained with any voltage input within the specified range. This provides consistent system performance regardless of line voltage fluctuations. It also eliminates the need for bulky, external constant–voltage transformers.
- **Load Regulation** provides constant ultrasound amplitude automatically regardless of power draw. The ultrasonic output amplitude level is held to within ±1% to provide weld process consistency and reduced weld cycle times.
- **High Line Voltage Power Supply** means that standard systems will operate worldwide at the local high line voltage level, whether it is 200VAC @60Hz in Japan, 240VAC @50Hz in Europe or 208VAC @60Hz in the United States. There are no internal transformer taps to change for worldwide operation.
- **Low Line Voltage Power Supply -** This optional 120V power supply is designed for North American applications.
- **Flow Through Cooling Tunnel** with a matched high–performance heatsink and thermostatically controlled fan reduces thermal gradients and increases component life.
- **AC Power Inrush** protection reduces electrical stress on the internal components by protecting them from AC power startup transient current surges.
- **Multiple Electronic Overload** protection circuits prevent instantaneous component failure in the event of extreme output overload conditions. The overload power limit is based on the actual true RMS power output level.
- **Process Limits** include: distance, time only, time and energy, and peak power. These programmable limits provide the means to adapt to a wide variety of welding applications.
- **Rear Panel Expansion Slot** is available to allow for custom configurations for OEM and cost effective solutions.
- **RS232 Serial Configuration Port** is used for field software upgrades, troubleshooting and advanced hardware setup with optional PC-based configurator.
- **CE Certification** means that the system meets the required European standards to be sold and used in Europe (high line voltage models only).
- **ISO 9001 Certification** means that this system has been manufactured to high quality standards and assures you of manufacturing excellence.

SECTION 2

Health and Safety

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General Considerations

Please observe these **health and safety recommendations** for safe, efficient, and injury-free operation of your equipment.

Proper Installation - Operate system components only after they are properly installed.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by Dukane Corporation. Unauthorized modifications could cause equipment damage and/or injury to the operator. In addition, unauthorized modifications will void equipment warranty.

Keep the Cover On - Do not remove any equipment cover unless directed to do so by Dukane Corporation. The generator produces hazardous electrical voltages which could cause injury.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection.

See *Electrical Safety* for grounding instructions, Page 9.

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable regulations (OSHA in the USA) for machine guarding and noise exposure.

Use Eye Protection - Wear ANSI approved safety impact goggles.

Acoustic Stack Hazard - When an acoustic stack (transducer, booster, horn and tip) is energized by the ultrasound signal, it presents a potential hazard. Stay clear of an energized stack.

System Abort Switch - Install a system abort switch at each operator station when ultrasonic plastic assembly equipment is used with automatic material handling equipment in an automated system.

Foot Switch - Using a foot switch in place of the optical touch finger switches (activation switches) violates OSHA regulations.

Continued

NOTE

These recommendations apply to the welding system. System in this manual refers to a complete group of components associated with the welding of parts, also known as an ultrasonic assembly system. A typical ***iQ Series*** System consists of the iQ generator, a press with thruster, switches, controls, cables, transducer, booster, horn, and fixture, and ***iQ Explorer*** software.

WARNING

Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION

At some time you may be asked to remove equipment covers by the Dukane Service Dept. personnel. Before doing so, disconnect the unit electrically from the incoming line AC power. If the unit is a press/thruster, lock the Air Lockout Valve, located on the rear panel, in its closed position.

General Considerations *Continued from previous page*

Pre-trigger Switch Adjustment - The pre-trigger switch option starts the horn vibrating before contacting the part to be welded. To ensure safe operation, adjust the pre-trigger so the ultrasound signal will not activate if the horn is more than ¼ in (7 mm) from the part to be welded.

System Electrical Cabling - Electrical power must be off when connecting or disconnecting electrical cables.

Do Not Wear Loose Clothing or Jewelry - They can become caught in moving parts.

Stay Alert - Watch what you are doing at all times. Use common sense. Do not operate the press when you are tired or distracted from the job at hand.

Do not Operate the Equipment - Your judgement or reflexes could be impaired while taking prescription medications. If so, do not operate the equipment. Be familiar with warning labels and recommended activity restrictions that accompany your prescription medications. If you have any doubt, do not operate the equipment.

Plastics Health Notice

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator's health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

CAUTION

Parts being joined ultrasonically will at times vibrate at audible frequencies. Wear ear protectors to reduce annoying or uncomfortable sounds. In addition, ultrasound baffles, sound enclosures, or materials that absorb sound may be located to surround the system.

WARNING

Keep head, hands, limbs and body at least six inches (152 mm) away from an operating press/ thruster. A vibrating, descending horn can cause burns and/or crushing injuries.

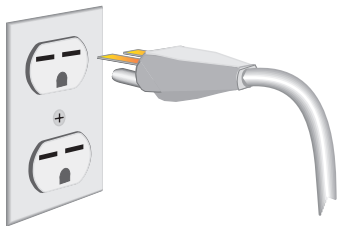
CAUTION

When making cable connections to system equipment or disconnecting cables from system equipment, make sure electrical power to the system is turned off, and AC power cords are removed from their receptacles. After the cables have been securely connected and the connections and cable routing checked a final time, the power may be restored.

Electrical Safety

Domestic Power Grounding

For safety, the power cords used on this product have a three-wire, grounding-type power cord. Figure 2-1 illustrates the appropriate electrical outlet to use with the power cord that is included with systems shipped to North America.



Approved 2 pole, 3 wire grounding receptacle HUBBELL No. 5652 or equivalent to NEMA 6–15R or 6–20R

Figure 2–1 Example of 220/240 Volt, Grounded, 3-Prong Receptacle

International Power Grounding

The power cable normally provided for international use is compatible with the power outlet used in many Continental European countries (Refer to Figure 2–2.) However, if your application requires another type of power cord, check with your equipment supplier, and follow local regulations concerning proper wiring and grounding.

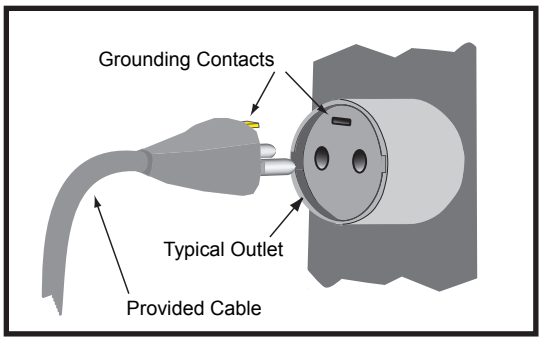


Figure 2–2 International 220/240V Grounding

CAUTION

If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply.

See Figures 2–1 and 2–2.

CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

100/120 Volt Systems (North America or Japan)

The power cord (including strain relief) supplied with the 100/120 AC systems is permanently attached to the rear of the generator. Units with this power cord are for use in North America or Japan.

Lifting the Equipment

	High Profile		Low Profile	
	lb	kg	lb	kg
Generator Only	25	11.3	20	9.1
Generator + Packing Materials	30	13.6	25	11.3

Table 2–I *iQ* Generator Weights

How to Lift Safely

- Before lifting, take a moment to think about what you're about to do.
- Examine the object for sharp corners, slippery spots or other potential hazards. Know your limit and don't try to exceed it.
- Ask for help if needed, or if possible, divide the load to make it lighter.
- Know where you are going to set the item down, and make sure it and your path are free of obstructions. Then follow these steps:

  Step 1. Stand close to the load with your feet spread apart about shoulder width, with one foot slightly in front of the other for balance.

  Step 2. Squat down bending at the knees (not your waist). Tuck your chin while keeping your back as vertical as possible.

  Step 3. Get a firm grasp of the object before beginning the lift. Begin slowly lifting with your LEGS by straightening them. Never twist your body during this step.

  Step 4. Once the lift is complete, keep the object as close to the body as possible. As the load's center of gravity moves away from the body, there is a dramatic increase in stress to the lumbar region of the back.

  Step 5. If you must turn while carrying the load, turn using your feet-not your torso. To place the object below the level of your waist, follow the same procedures in reverse order. Remember, keep your back as vertical as possible and bend at the knees.

CAUTION

Take care when lifting the equipment. We recommend using a mechanical lift device to assist.

SECTION 3

Installation

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Before Installation

As you plan for the installation of your generator, please consider these important subjects as listed below:

- When to use lockout / tagout devices
- Lifting the generator safely - See Section 2 - *Health and Safety*, Page 10.

When to Use Lockout / Tagout Devices

Figure 3-1 Lockout Device In Open Position, Unlocked

The typical kind of LOTO device for this generator is a clam shell type device (with lockout capability). The LOTO device is placed over the plug end of the generator electrical cord. This effectively prevents access to the energy isolation point. See the example of one such device in the figure above.

The figure to the right shows the lockout device in the closed, locked position.

Figure 3-2 Bottom Lockout Device In Closed Position, Locked

WARNING

Electrical safety hazards exist inside the generator chassis. Before making any internal adjustments to the generator, apply a lockout/tagout (LOTO) device to the generator chassis.

Continued

Lockout/Tagout

Continued from previous page

Procedure to use BEFORE making any internal adjustments to the generator:

1. Push the generator's AC power switch/breaker to the OFF position.
2. Unplug the generator's electrical cord from its source.
3. Authorized personnel apply a lockout/tagout (LOTO) device to the plug end of the generator's electrical cord. Using a typical clam shell type LOTO device:
   1) Open the clam shell.
   2) Place the electrical cord plug end inside the shell.
   3) Close the shell.
   4) Secure the shell with its lock, and lock it.
4. Wait a minimum of five minutes for the generator to discharge its electrical energy.
5. After taking these steps, make the necessary adjustments to the generator.

Assuming the generator is being put back into service. . .

Procedure to use AFTER making any internal adjustments to the generator:

1. Authorized personnel remove the lockout/tagout device from the plug end of the generator's electrical cord. Using a typical clam shell type LOTO device:
   1) Unlock the protective shell.
   2) Open the shell, exposing the electrical cord end.
   3) Remove the LOTO device, and set it aside.
2. Plug the generator's electrical cord into its AC power source.
3. Push the generator's AC power switch/breaker to the ON position.

Unpacking

Carefully open your shipping container, and make sure it contains the items shown on the shipping documents. Inspect all items, and report any damage immediately.

Placement

Generator placement and cable routing should permit easy access and not interfere with normal system operation.

Allow at least 5 inches (13 cm) of space on both ends of the generator chassis for air circulation. Allow space - between 3-6 inches, [8-15 cm] - at the rear of the chassis for cable clearance. (*The amount of space depends on the chassis type and what rear panel connections there are.*)

See *Section 10 - Specifications,* for generator drawings.

CAUTION

Allow 5 inches for air ventilation at the cooling air inlet and at the exhaust air outlet. The fan draws in fresh air to cool the internal components, reduce thermal gradients and increase component life.

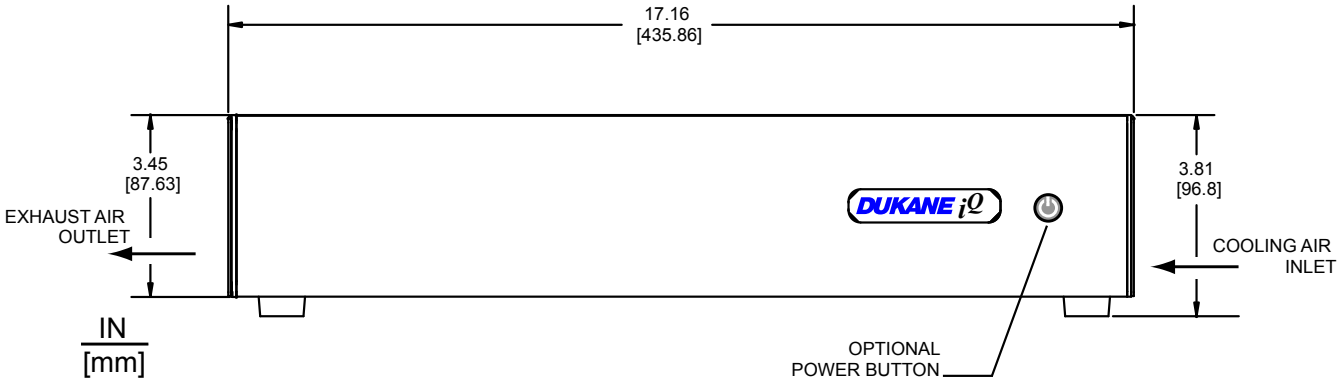

Figure 3-3 Generator Front View (typical) Low Profile

Continued

Placement in a Seismic Region

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If the ***iQ*** generator is to be used in an active seismic region, secure the unit by rack-mounting it or by securing the unit to a benchtop.

Rack-Mounting

Install the four brackets from Dukane's rack-mount kit to the generator. See Table 3-I, and Figure 3-4 (showing a low profile unit) below.

Mount the generator to a 19-inch equipment rack.

System Type	Dukane Part Number
High Profile	147-4721
Low Profile	147-4720

Table 3-I Rack Mount Bracket Part Numbers

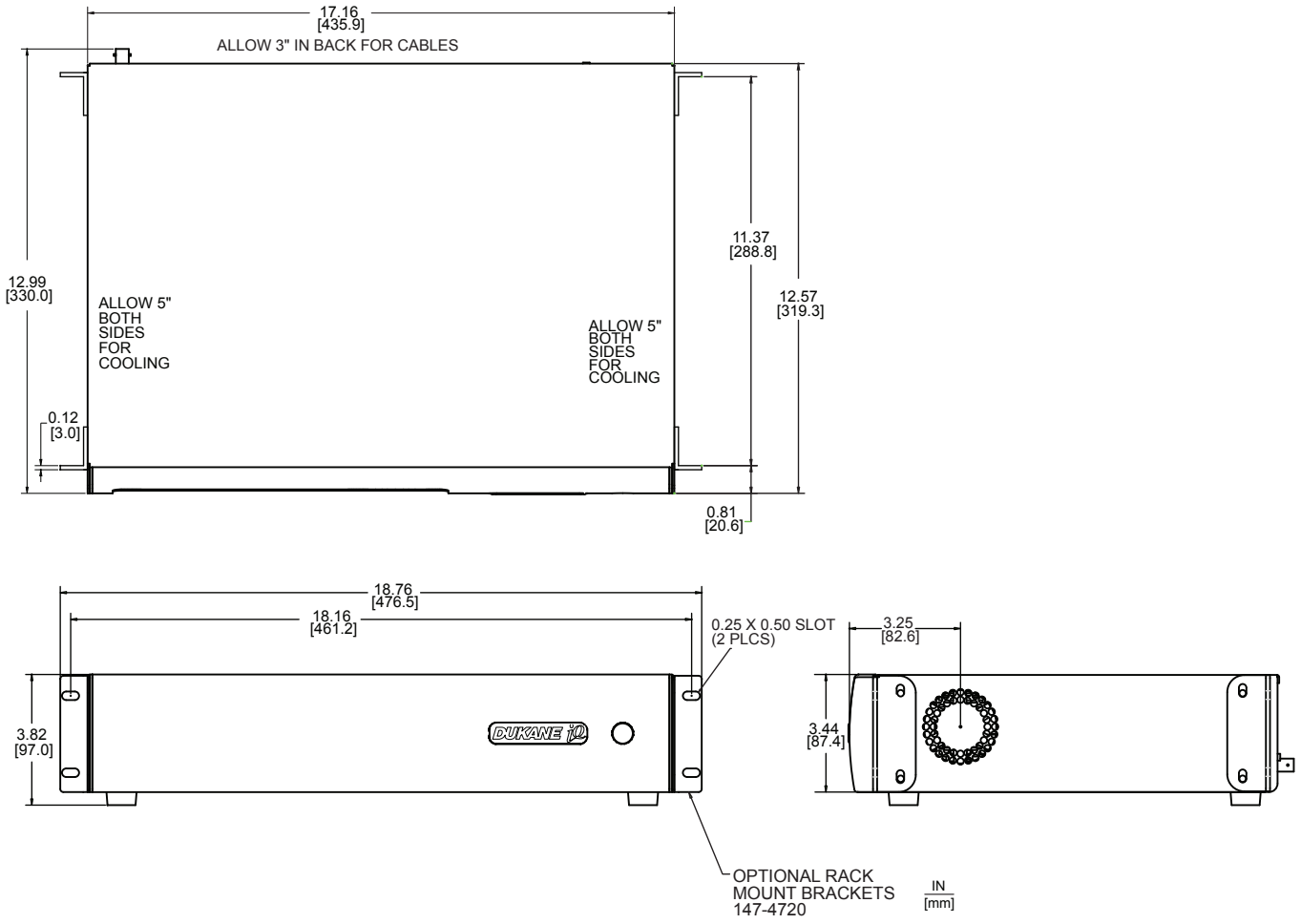

Figure 3-4 Rack Mounting ***iQ*** Generator

Continued

Benchtop Mounting *Continued from previous page*

If you choose to mount the generator on a benchtop follow these instructions:

1) Install the four (4) optional hold down brackets. See Figure 3-5 below.
2) Secure the slot side of each bracket to the generator's sheet metal cover.
3) Secure the hole side of each bracket to the bench itself.

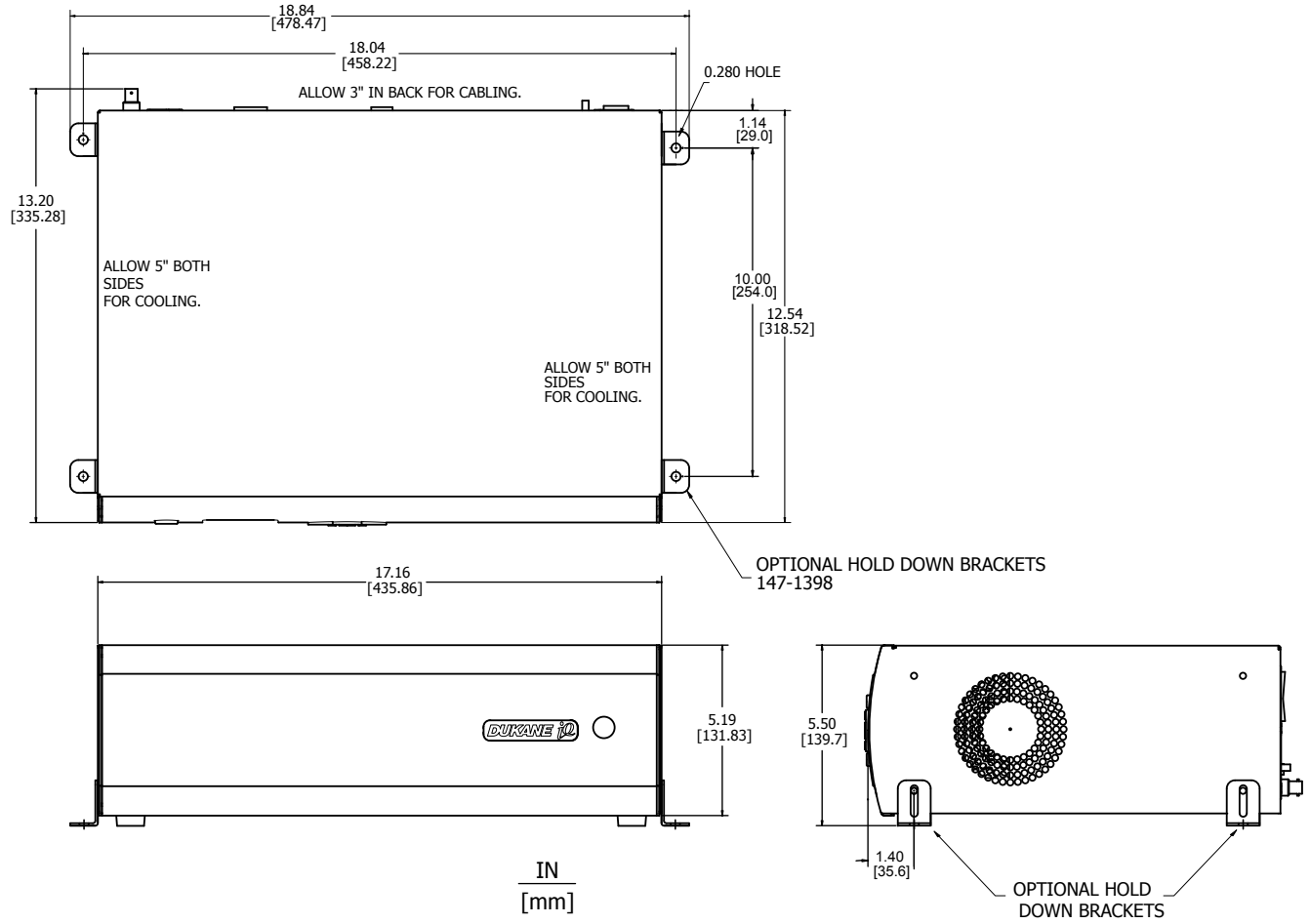

Figure 3-5 Securing *iQ* Generator to Benchtop

Rear Panel Layout Overview

This section provides an overview of the generator rear panel layout, which includes panel areas dedicated to various standard system functions and options that are available. Figure 3-6 illustrates a typical panel layout.

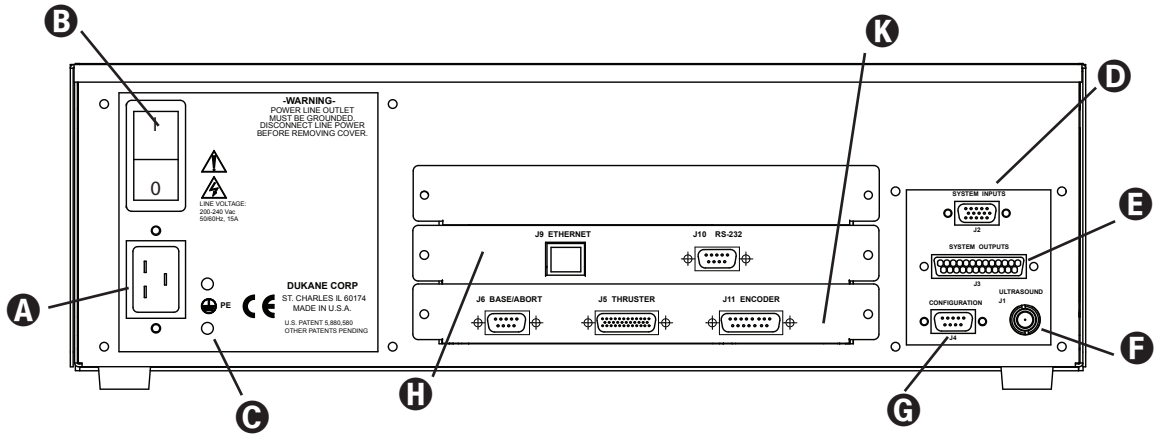

Figure 3-6 Generator Rear Panel - Pneumatic Press/Thruster

AC Power Inlet Panel

Ⓐ IEC Power Inlet Connector – Attaches to an IEC style power cord.

Ⓑ Power Switch – Circuit Breaker – Used to switch system power ON and OFF.

Ⓒ Chassis Grounding Stud – Chassis connection for a protective earth ground.

The System I/O Panel

Ⓓ System Input Connector (J2) – Connections for system control input signals.

Ⓔ System Output Connector (J3) – Connections for system status output signals.

Ⓕ Ultrasound Output Connector (J1) – Coaxial high voltage connection to ultrasonic stack.

Ⓖ Configuration Port Connector (J4) – Digital control port to modify system parameters.

Options Module Panel

Ⓗ Communications board

Shown in the example above are these ports:

J9 - Ethernet, and

J10 - Serial RS232

Ⓚ Press interface board.

Shown in the example above are these ports:

J6 - Base/Abort

J5 - Thruster

J11 - Encoder

NOTE

The press interface board is available in several different configurations. See Section 8, Options for more information.

AC Power Inlet Panel

The standard AC power inlet panel is described in this section.

IEC AC Power Inlet Connector

The IEC AC power inlet connector mounted on the system AC power inlet panel requires a properly configured IEC compliant power cord, which enables worldwide system operation by simply changing the power cord.

Low profile systems are equipped with a 10 amp rated IEC inlet connector. The high profile systems include a 16/20 amp rated IEC inlet connector. 120 VAC and 3600/4800W systems include a non-detachable power cord.

An appropriately rated power cord must be securely attached to the welding system's IEC inlet connector. If the correct power cord configuration is not included with the system for the local AC power outlet at your location, an appropriate IEC power cord should be available from a local electrical parts supplier. Note that the system undervoltage lockout will inhibit system operation if a North American power cord configured for 120V is connected to the system. A minimum of 200V is required for the system to operate.

Power Switch/Circuit Breaker

The power switch/circuit breaker has a rocker type actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized I symbol, the power OFF position is marked with the 0 symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position. If when resetting the circuit breaker after it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will require service.

Do not repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Chassis Grounding Stud

The chassis grounding stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in a industrial environment. The chassis ground stud is C in Figure 3-7. Proper system grounding is discussed on Page 9.

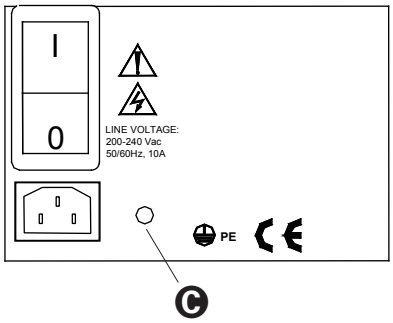

Figure 3-7 IEC AC Power Inlet Connector

System I/O Panel

The standard system I/O panel is described in this section.

System Inputs Connector

The SYSTEM INPUTS connector mounted on the system I/O panel includes connections for all of the basic system control input signals, that will typically come from an automated control system. The cable attached to this connector includes all of the available system control signals, which will be controlled by an output card or output port on the automation controller.

The user can determine which signals to use for each particular welding application, but there must be at least one connection to this connector in order to activate the ultrasound output. All of the input signals on this connector are electrically isolated (signals are NOT referenced to chassis ground) and activated when a 24VDC voltage source is connected to the signal input pin, referenced to the isolated common pin. The electrically isolated input signals can be driven from an automation controller output that is either sinking (NPN) or sourcing (PNP), depending upon how the isolated common connection is terminated. All inputs sink or source 10mA of current from a 24VDC power supply.

Continued

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Note that a simple switch closure (relay contact) connected to a control input can not activate the input without adding an external power supply to power the input. Adding jumper connections to pins available on the System Inputs connector, can configure switch closure inputs to operate referenced to generator chassis ground (non-isolated), without adding a separate power supply, if desired.

Refer to *Application Note AN507* (Automation Interface Guidelines) at ***http://www.dukane.com/us/DL_ApplData.asp*** for wiring diagrams of example applications.

System Inputs Connector Pinout

The SYSTEM INPUTS connector is a HD-15F (high density D-subminiature 15 circuit female) connector. Connector pin numbers for this connector are shown in Figure 3-9. The male connector on the cable is a mirror image of the panel-mounted connector and is shown in Figure 3-10. Table 3-II lists the signal names and descriptions, with more detailed descriptions that follow. The wire color coding for the system input cable is listed in Table 3-II, to assist with custom automation system wiring and assembly.

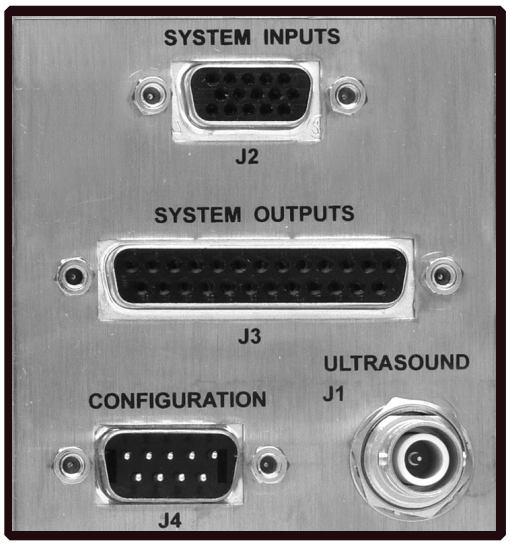

Figure 3-8 System I/O Panel (standard panel shown)

NOTE

Refer to *Section 8, Options* for information on optional features.

Pin	Signal Name	Cable Color Code	Signal Option Requirements
1	+22V	BLK	
2	Power Ground	WHT	
3	Remote Setup Selection Bit 0 Input	RED	
4	Remote Setup Selection Bit 1 Input	GRN	
5	Remote Setup Selection Bit 2 Input	ORN	
6	Remote Setup Selection Bit 3 Input	BLU	
7	Remote Setup Selection Bit 4 Input	WHT/BLK	
8	Ultrasound Activation/Cycle Start Input	RED/BLK	
9	Not Used	GRN/BLK	Not Used
10	Front Panel Control Lock Input	ORN/BLK	Not Used
11	Press Inhibit for Hand Probes	BLU/BLK	Hand Probe
12	System Latch Reset Input	BLK/WHT	
13	Isolated Common	RED/WHT	
14	Not Used	GRN/WHT	
15	Automation Cycle Stop Input	BLU/WHT	

Table 3-II Generator Input Signals (J2)

System Inputs Signal Descriptions

Pin 1 (+22V)

This pin can supply +22VDC at up to 250mA to power the user's automation controls.

Pin 2 (Power Gnd)

Pin 2 is the 22VDC return and is tied to the system chassis ground.

Pin 3 (Remote Setup Selection Bit 0 Input)

Pin 3 is the Remote Setup Selection Bit 0, which is the least significant bit used to select different welding setups with an automation control system.

Pin 4 (Remote Setup Selection Bit 1 Input)

Pin 4 is the Remote Setup Selection Bit 1, which is the second least significant bit used to select different welding setups with an automation control system.

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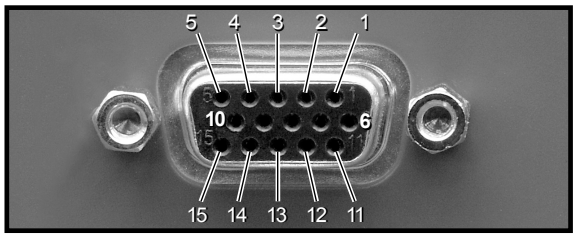

Figure 3-9 HD-15F, Generator Input Connector

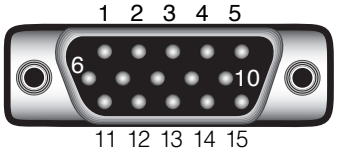

Figure 3-10 HD-15M, Generator Input Cable Connector

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Pin 5 (Remote Setup Selection Bit 2 Input)

Pin 5 is the Remote Setup Selection Bit 2, which is the third least significant bit used to select different welding setups with an automation control system.

Pin 6 (Remote Setup Selection Bit 3 Input)

Pin 6 is the Remote Setup Selection Bit 3, which is the second most significant bit used to select different welding setups with an automation control system.

Pin 7 (Remote Setup Selection Bit 4 Input)

Pin 7 is the Remote Setup Selection Bit 4, which is the most significant bit used to select different welding setups with an automation control system.

Pin 8 (Ultrasound Activation/ Cycle Start Input)

Pin 8 is used to activate the generator ultrasound output. Activation of this control input will switch the ultrasound output ON, and deactivating this signal will switch ultrasound OFF. This input signal will also function as a cycle start input, where the ultrasound activation and timing are completely under the control of the process controller. Depending on the welding process controller setup, this input signal could be activated momentarily to start a welding cycle.

Pin 9 (Not Used)

Pin 10 (Not Used)

Pin 11 (Press Inhibit for Hand Probes)

Pin 11 is used to disconnect power applied to a press or thruster, if a hand probe is connected to the system input connector, for safety considerations. The hand probe activation switch could unexpectedly start a welding cycle that activates a press or thruster to the down position. The hand probe cable connector is wired to apply chassis ground to this pin, when it is attached to the system, which activates a press inhibit relay that disconnects power from the pneumatic press valves. This pin must be left open whenever a press control board is installed. Connecting this pin to chassis ground will inhibit press operation.

Pin 12 (System Latch Reset Input)

Pin 12 is used to reset the Any Fault or System Overload status outputs (See Status Output descriptions.). If a fault occurs during a weld cycle, these outputs will normally remain active until the next weld cycle is initiated. Activating this input will reset the status output faults and may simplify automation programming.

Pin 13 (Isolated Common)

Pin 13 is electrically isolated from chassis ground. Using isolated sourcing (PNP) output drivers, this common line would be connected to isolated ground potential. Using isolated sinking (NPN) output drivers, this common line would be connected to the isolated positive supply voltage output.

Pin 14 (Not Used)

Pin 14 is an open connection.

Pin 15 (Automation Cycle Stop Input)

Pin 15 is an input control signal that when enabled, can be used by the automation control system as a redundant signal to shut the ultrasound output off. This signal could also be reconfigured through menu selections to function as an automation end-of-weld control signal input.

Pin	Signal Name	Cable Color Code	Signal Option Requirements
1	+22V	BLK	
2	Spare Output	WHT	
3	+22V Power Ground	RED	
4	Programmable Status Output 1	GRN	
5	Programmable Status Output 2	ORN	
6	Ultrasound Active Status Output	BLU	
7	Any Fault Status Output	WHT/BLK	
8	Press Trigger Status Output	RED/BLK	
9	System Overload Status Output	GRN/BLK	
10	System Online Status Output	ORN/BLK	
11	Press Top of Stroke Status Output	BLU/BLK	
12	Current Loop OK Status Output	BLK/WHT	Not Used
13	Analog Monitor Signal Common	RED/WHT	
14	Not Used	GRN/WHT	
15	Power Signal Monitor Output	BLU/WHT	
16	Amplitude Monitor Output	BLK/RED	
17	Amplitude/Power Regulation Status Output	WHT/RED	
18	MPC Ready Status Output	ORN/RED	Not Used
19	System Power OK Status Output	BLU/RED	
20	Bad Part Status Output	RED/GRN	
21	Good Part Status Output	ORN/GRN	
22	System Ready Status Output	BLK/WHT/RED	
23	Suspect Part Status Output	WHT/BLK/RED	
24	Isolated Common	RED/BLK/WHT	
25	Not Used	GRN/BLK/WHT	

Table 3-III System Output Connector Signals (J3)

System Outputs Connector

The SYSTEM OUTPUTS connector mounted on the generator I/O panel includes connections for all of the basic system status and monitor output signals, which will typically connect to an automated control system. The cable attached to this connector includes all of the available system output signals, which will be read or monitored by a digital input card or analog inputs on the user-supplied automation controller.

The user can determine which signals are appropriate for each welding application.

The system monitor output signals are analog signals used to monitor ultrasonic amplitude setting and ultrasonic output power levels, referenced to the Monitor Common (Pin 13).

Continued

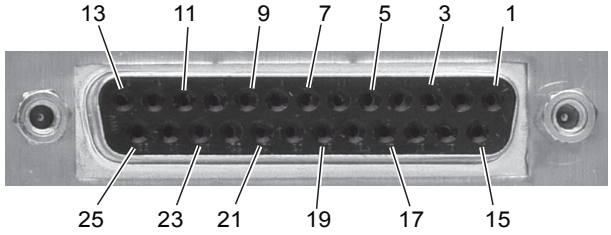

Figure 3–11 DB-25F, Generator Output Connector (J3)

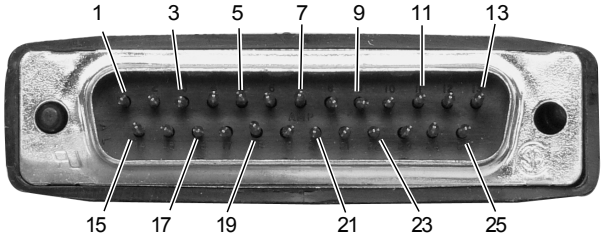

Figure 3–12 DB-25M, Generator Output Cable Connector

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This is at system chassis ground potential (non-isolated). All of the digital output status signals on this connector, are isolated (signals are not referenced to generator chassis ground). When a status output signal is activated, it will sink current (500mA Max. sourced by a 24VDC supply) to isolated common. In automation terms, the outputs are NPN (sinking) and would drive a PNP (sourcing) input that is referenced to the Isolated Common pin.

The digital status output signals can only sink current to isolated common. They cannot be changed to a sourcing (PNP) type output. If sourcing status outputs are required, there is an optional isolated NPN to PNP conversion module that is DIN rail mountable. The module converts the standard isolated sinking (NPN) status output signals to isolated sourcing (PNP) status output signals. Consult your local sales representative for information about the conversion module.

System Outputs Connector Pinout

The SYSTEM OUTPUTS connector is a DB-25F (standard D-subminiature 25 circuit female) connector. Connector pin numbers for this connector are shown in Figure 3-11. The male connector on the cable is a mirror image of the panel mounted connector and is shown in Figure 3-12. Table 3-III lists the signal names. Detailed descriptions are listed in *System Outputs Signal Descriptions* that follow. To assist with custom automation system wiring and assembly, the wire color coding for the system outputs cable is listed in Table 3-III.

System Outputs Signal Descriptions

Pin 1 (+22V Power Supply)

This pin can supply +22VDC at up to 250mA to power the user's automation controls.

Pin 2 (Not Used)

Pin 2 is an open connection.

Pin 3 (+22V Power Ground)

Pin 3 is the 22VDC return and is tied to the system chassis ground.

Pin 4 (Programmable Status Output 1)

Pin 4 is a digital active low status output that can be reprogrammed and assigned to other system status signals (from the available selections) from the System tab in ***iQ Explorer***.

Pin 5 (Programmable Status Output 2)

Pin 5 is a digital active low status output that can be reprogrammed and assigned to another system status signal (from the available selections) from the System tab in ***iQ Explorer***.

Pin 6 (Ultrasound Active Status Output)

Pin 6 is a digital active low status output that activates when the system is delivering ultrasonic power to the load attached to the ultrasound output connector. This output will be an open circuit when the ultrasound output is off.

Pin 7 (Any Fault Status Output)

Pin 7 is a digital active low status output that activates whenever any fault condition is detected that inhibits ultrasound output and normal system operation. This output will be an open circuit when no system fault conditions are detected.

Generator faults that will activate the Any Fault output:

- Overload (Average, Peak, or Frequency)
- Overtemperature Fault
- System Power Fault

Pin 8 (Press Trigger Status Output)

Pin 8 is a digital active low status output that activates when the specified trigger type has occurred. It will remain active until the thruster head raises to the top of the stroke. This output will be an open circuit when a trigger condition hasn't been detected.

Continued

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Pin 9 (System Overload Status Output)

Pin 9 is a digital active low status output that activates whenever any overload condition is tripped. Activation of the overload status output signal could be caused by an average overload, a positive peak overload or a negative peak overload condition. After the overload status output activates, it will remain active until the next ultrasound activation cycle begins and this output will automatically reset. This output will be an open circuit when no overload conditions have been detected.

Pin 10 (System On-Line Status Output)

Pin 10 is a digital active low status output that activates when the system is in the ON LINE operating mode, which enables the activation of the ultrasonic output. This output will be an open circuit if the system is switched to the OFF LINE operating mode, which will prevent the start of a welding cycle or activation of the ultrasound output. Note that an automation controlled process can not weld any parts, if the system is, accidentally or otherwise, switched to the OFF LINE operating mode.

Pin 11 (Press Top of Stroke Status Output)

Pin 11 is a digital active low status output that activates when the press/thruster head is in the top of stroke position. This output will be an open circuit when the press/thruster head is not at the top of stroke position**.**

Pin 12 (Not Used)

Pin 13 (Analog Monitor Signal Common)

Pin 13 is the signal common (ground) connection for all of the analog monitor signals (on Pins 15 and 16). This signal common pin is connected to system chassis ground and is not isolated from the generator chassis. This is an analog signal ground connection. Do not connect anything to this ground connection, except the wiring to the inputs of the analog instrumentation devices used to measure the monitor output signals.

Pin 14 (Not Used)

Pin 14 is connected to the system chassis ground.

Pin 15 (Power Signal Monitor Output)

Pin 15 is an analog output signal used to monitor the power output from the welding system. The scaling on this output signal is as shown below:

15kHz, 20kHz, 30kHz and 40kHz systems

1 Watt = 0.001 VDC (1mV per Watt)

50kHz and higher systems

1 Watt = 0.010 VDC (10mV per Watt)

Examples: 20kHz system measures 0.525 VDC on Power Monitor Output = 525 Watts

50kHz system measures 0.525 VDC on Power Monitor Output = 52.5 Watts

Pin 16 (Amplitude Monitor Output)

Pin 16 is an analog output signal used to monitor the system amplitude setting. The scaling on this output signal is 100% amplitude = 10.0 VDC, or 0.1 VDC per 1% amplitude. This monitor signal output would typically be used when a remote control option board is installed in the system. The automation control system will adjust the system's amplitude setting remotely, using a 4-20mA current loop attached to the input of the remote control board. Using this monitor output, the control system can verify that the amplitude is set to the expected programmed amplitude level.

Continued

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Pin 17 (Amplitude/Power Regulation Status Output) (*Contact your sales representative about Power Regulation availability.*)

This status signal is most useful when the power regulation mode is selected. This Out of Regulation status signal would indicate that due to inadequate pressure against the ultrasonic horn, the power regulation level setting can not be achieved when the amplitude level is set to the maximum level of 100%.

In the amplitude regulation mode, this signal will be activated at the end of the ramp-up time until the beginning of the ramp-down time. This status signal will be active for the time the ultrasound is at the programmed amplitude setting.

Pin 17 is a digital active low status output that activates when the system is regulating the amplitude or power level correctly. This output becomes an open circuit when the system falls out of regulation. When that happens, it cannot adjust the system output to the output level that was programmed as the regulation set point.

Pin 18 (Not Used)

Pin 19 (System Power OK Status Output)

Pin 19 is a digital active low status output that activates when no fault conditions are detected by any of the power fault detection circuits included in the system. This output will be an open circuit when any power related fault is detected in the system.

Pin 20 (Bad Part Status Output)

Pin 20 is a digital active low status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed bad part limits. This output will be an open circuit when a bad part has not been detected.

Pin 21 (Good Part Status Output)

Pin 21 is a digital active low status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle do not exceed the programmed suspect or bad part limits. This output will be an open circuit after a welding cycle when either a suspect or bad part has been detected.

Pin 22 (System Ready Status Output)

This status output signal will activate only when the system is ready to activate ultrasound or begin a weld cycle. Pin 22 is a digital active low status output that activates when a weld processing cycle is completed and the welding process control system is ready to start the next welding cycle. This output will be an open circuit when the welding process controller determines that the next welding cycle cannot be started. This includes system faults or off line active, but not a process fault like Overload.

Pin 23 (Suspect Part Status Output)

Pin 23 is a digital active low status output that activates, either momentarily or until the start of the next welding cycle, when the welding parameters recorded during the previous welding cycle are outside of the programmed suspect part limits. This output will be an open circuit after a welding cycle when a suspect part has not been detected.

Pin 24 (Isolated Common)

Pin 24 is electrically isolated from chassis ground. This common line should be connected to negative output at a user-provided isolated 24VDC power supply. The isolated NPN status output signals can drive PNP inputs.

Pin 25 (Not Used)

Pin 25 is an open connection.

Ultrasound Output Connector

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.

Figure 3-13 Ultrasound Output Connector

Configuration Port Connector

The configuration port connector is a DB-9M (standard D-subminiature 9 circuit male) typically used for RS-232 serial communications. This serial port (DTE) connects to a serial port (DCE) on a computer via a standard 9 pin serial cable. If the computer does not have a serial port, you may use a USB-to-serial conversion cable.

This port is used for field updates to the generator firmware, without removing the enclosure cover. This port can also be used with a software application running on a Windows PC to modify the factory default system settings and hardware configurations. Contact your local sales representative for software availability information and access to documentation that will allow you to make use of the configuration port features.

CAUTION

The ultrasonic output from this connector (that drives the attached ultrasonic load) is a very high AC voltage (1200VAC). At high power levels this can exceed 2 amperes of current and must be securely terminated via the ultrasound cable for safe operation. Use original equipment ultrasound cables for safe and reliable system operation. Improperly assembled ultrasound cables can result in high voltage arcing and will destroy the ultrasound connectors.

Do not use your generator if there is any evidence of arcing (black carbon deposits) on either the ultrasound output connector or the ultrasound cable connectors.

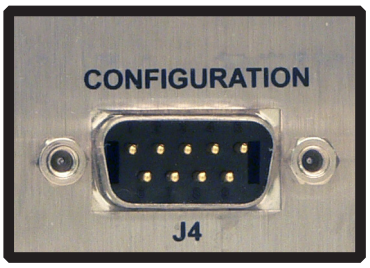


Figure 3-14 Configuration Port Connector

RFI Grounding

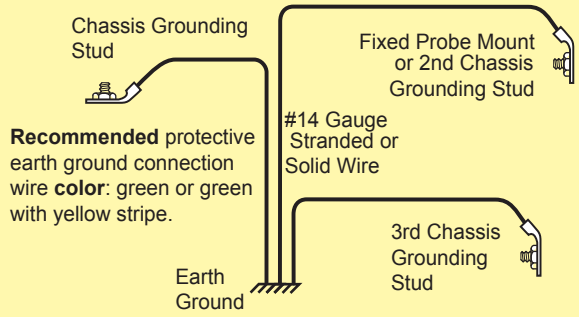
The ***iQ Series*** generator provides the operating power and power returns. Make sure the generator is grounded properly.

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). Every generator contains a RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

If you experience problems with RFI from the press, run an additional grounding wire from the press base grounding stud to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp. Use at least 14 AWG wire for the connection to the press base.

CAUTION

To minimize electrical noise and eliminate ground currents, ground the chassis as shown. Use a STAR configuration (illustrated below). Do not DAISY CHAIN the grounds.



Connecting Cables

Step 1. **Ground the generator** chassis with the supplied 14-Gauge wire, and attach it to the grounding stud. See Figure 3-7.

Step 2. **Ultrasound (J1**) - This output connects the Ultrasound Output of the ***iQ Series*** generator to the transducer, through a coaxial cable. The electrical welding signal is transmitted through this cable.

Step 3. **Operational Control (J201)** - This cable runs from J201 on the thruster to the generator's Thruster connector (J5). The generator provides controls for triggering the weld, operating the thruster's pneumatic system, and providing 24 VDC operating voltage through this cable. The press driver card in the generator also provides monitoring for these functions.

Step 4. **Encoder (J11) (Optional)** - The purpose of the encoder cable is to connect the distance encoder option to the generator's Encoder Port (J11).

Step 5. **Ethernet Cable (J9)** - Connects to the PC, LAN port.

Step 6. **RS-232 Cable (J10)** - Connects to the PC, RS-232 port.

Step 7. **Base/Abort Cable (J6) -** Connects to the press base plate connector (J35) or an automation PLC**.**

Step 8. **Connect the AC power cord** to the IEC power inlet connector on the ultrasonic generator, and plug the other end into an approved AC outlet.

CAUTION

The power cord is equipped with a three-prong, grounded-type plug for your safety. Whenever a two-slot receptacle is encountered, we strongly recommend that it is replaced with a properly grounded three-lead receptacle.

Have a qualified electrician do the replacement in accordance with the National Electrical Code and local codes and ordinances. DO NOT cut off the power cord grounding prong or alter the plug in any way.

Power Cords

The AC line cords supplied with the standard generators are matched to the ultrasonic output power rating and the continent of specified use. See Table 3-IV.

Continent of Use	Power Cord Part Number	Power
North America	200 - 1110	240V, 15A
	200 - 1541	240V, 10A
Continental Europe	200 - 1111	240V, 16A
	200 - 1542	240 V, 10A

Table 3-IV Power Cords

Three Configurations

The ***iQ*** generator, ES models are configured in three basic ways:

1) With a pneumatic press/thruster
2) With a remote controller and a servo press/thruster
3) With a servo press/thruster

Diagrams and tables that follow show these three configurations and list the cables used respectively.

Connecting Cables

Pneumatic Press/Thruster

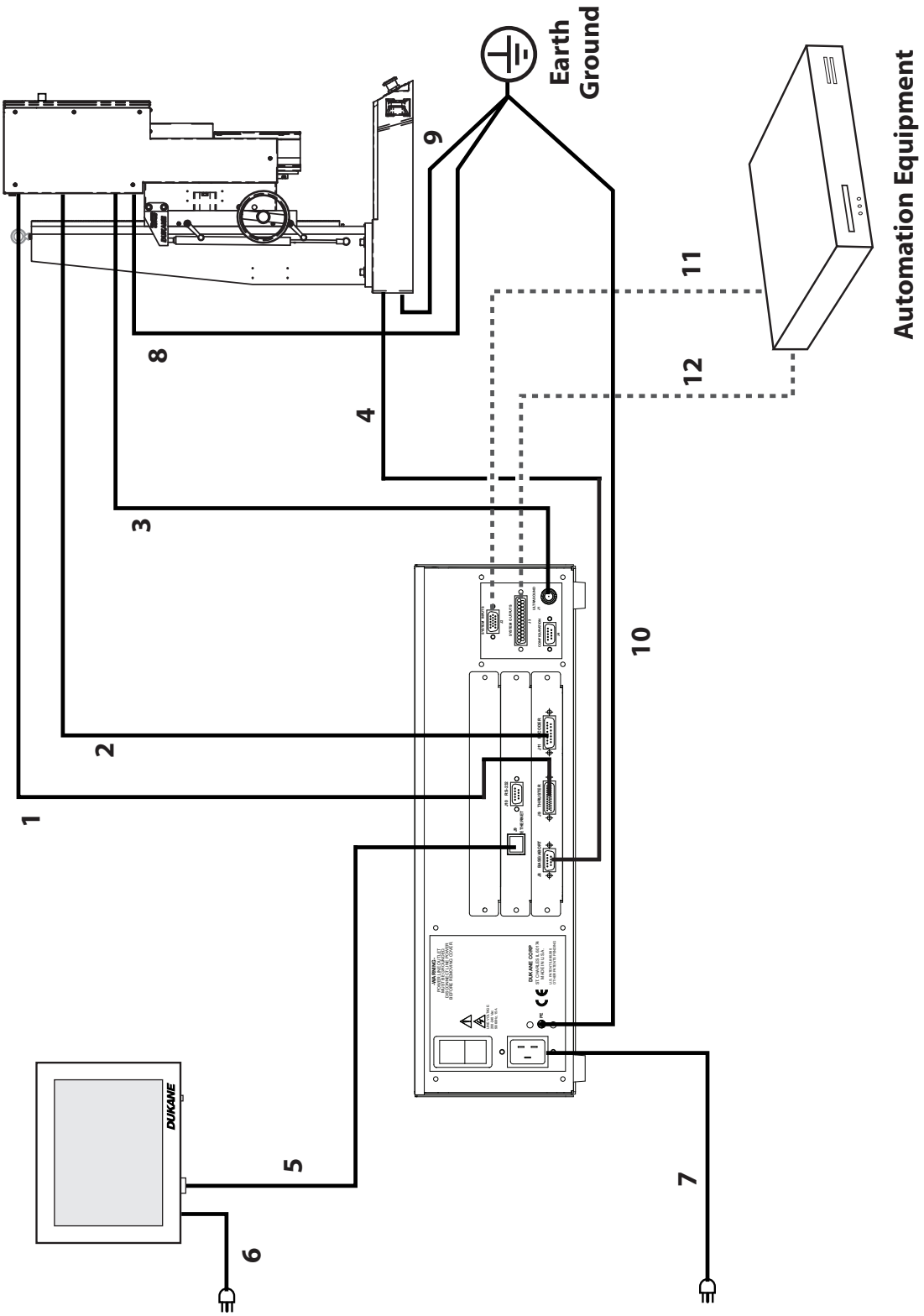


Figure 3-15 *iQ* Generator and Pneumatic Press/Thruster - Connections Diagram

Continued

Pneumatic Press/Thruster

Continued from previous page

Cable No.	Part Number	Length	Connections			
			Generator	Base	Thruster	HMI
1	200-1556-XXM	XX	J5	-	OPERATIONAL CONTROL	-
2	200-1613-XXM	XX	J11	-	ENCODER	-
3	200-479-XXM	XX	J1	-	ULTRASOUND	-
4	200-1545-XXM	XX	J6	J35	-	-
5	200-1553-XXM	XX	J9	-	-	ETHERNET
6	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	AC INPUT
7	One of the following: 200-1110 (240 VAC, 15A, US) 200-1111 (240 VAC, 16A, Europe) 200-1612 (240 VAC, 15A, India) 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) (for 120 VAC models, power cord is integral to generator)	2.4	AC INPUT	-	-	-
8	200-1557	5	-	-	PE	-
9	200-1557	5	-	GRND	-	-
10	200-1557	5	PE	-	-	-
11	200-1380-XXM	XX	J2	-	-	-
12	200-1381-XXM	XX	J3	-	-	-

Table 3-V ***iQ*** Generator and Pneumatic Press/Thruster Cables

Continued

Servo Press/Thruster (Version 1)

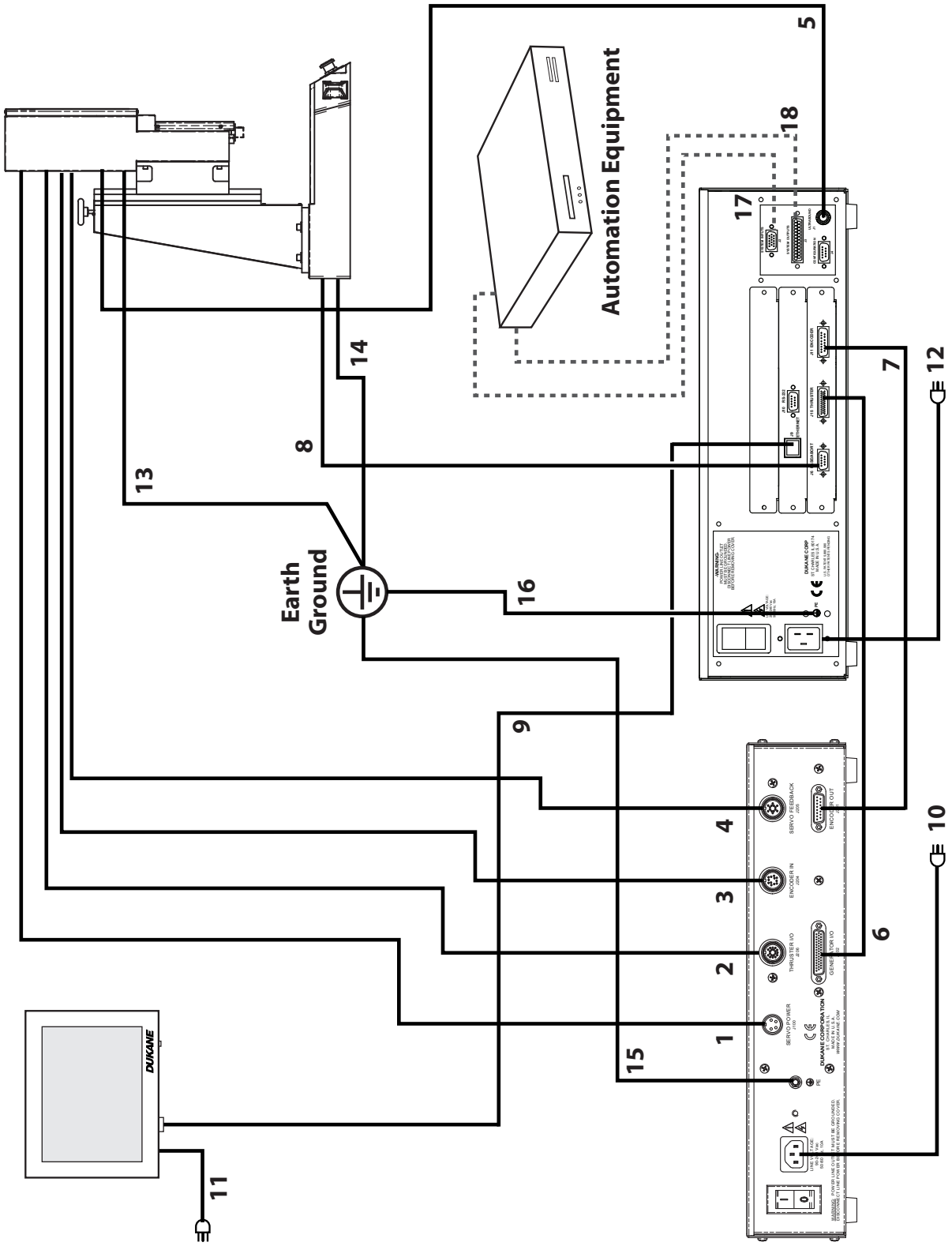


Figure 3-16 *iQ* Generator, Remote Controller, and Servo Press/Thruster - Connections Diagram *Continued*

Servo Press/Thruster (Version 1)

Continued from previous page

Cable No.	Part Number	Length (meters)	Connections				
			Generator	Base	Thruster	Remote Controller	HMI
1	200-1646-XXM	XX	-	-	SERVO POWER	J100	-
2	200-1647-XXM	XX	-	-	THRUSTER I/O	J206	-
3	200-1648-XXM	XX	-	-	ENCODER	J204	-
4	200-1649-XXM	XX	-	-	SERVO FEEDBACK	J205	-
5	200-479-XXM	XX	J1	-	ULTRASOUND	-	-
6	200-1556-XXM	XX	J15	-	-	J202	-
7	200-1613-XXM	XX	J11	-	-	J201	-
8	200-1545-XXM	XX	J6	J35	-	-	-
9	200-1553-XXM	XX	J9	-	-	-	ETHERNET
10	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	AC INPUT	-
11	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	-	AC INPUT
12	One of the following: 200-1110 (240 VAC, 15A, US) 200-1111 (240 VAC, 16A, Europe) 200-1612 (240 VAC, 15A, India) 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) (for 120 VAC models, power cord is integral to generator)	2.4	AC INPUT	-	-	-	-
13	200-1557	5	-	-	PE	-	-
14	200-1557	5	-	GRND	-	-	-
15	200-1557	5	-	-	-	PE	-
16	200-1557	5	PE	-	-	-	-
17	200-1380-XXM	XX	J2	-	-	-	-
18	200-1381-XXM	XX	J3	-	-	-	-

Table 3-VI *iQ* Generator, Remote Controller, and Servo Press/Thruster Cables

Servo Press/Thruster (Version 2)

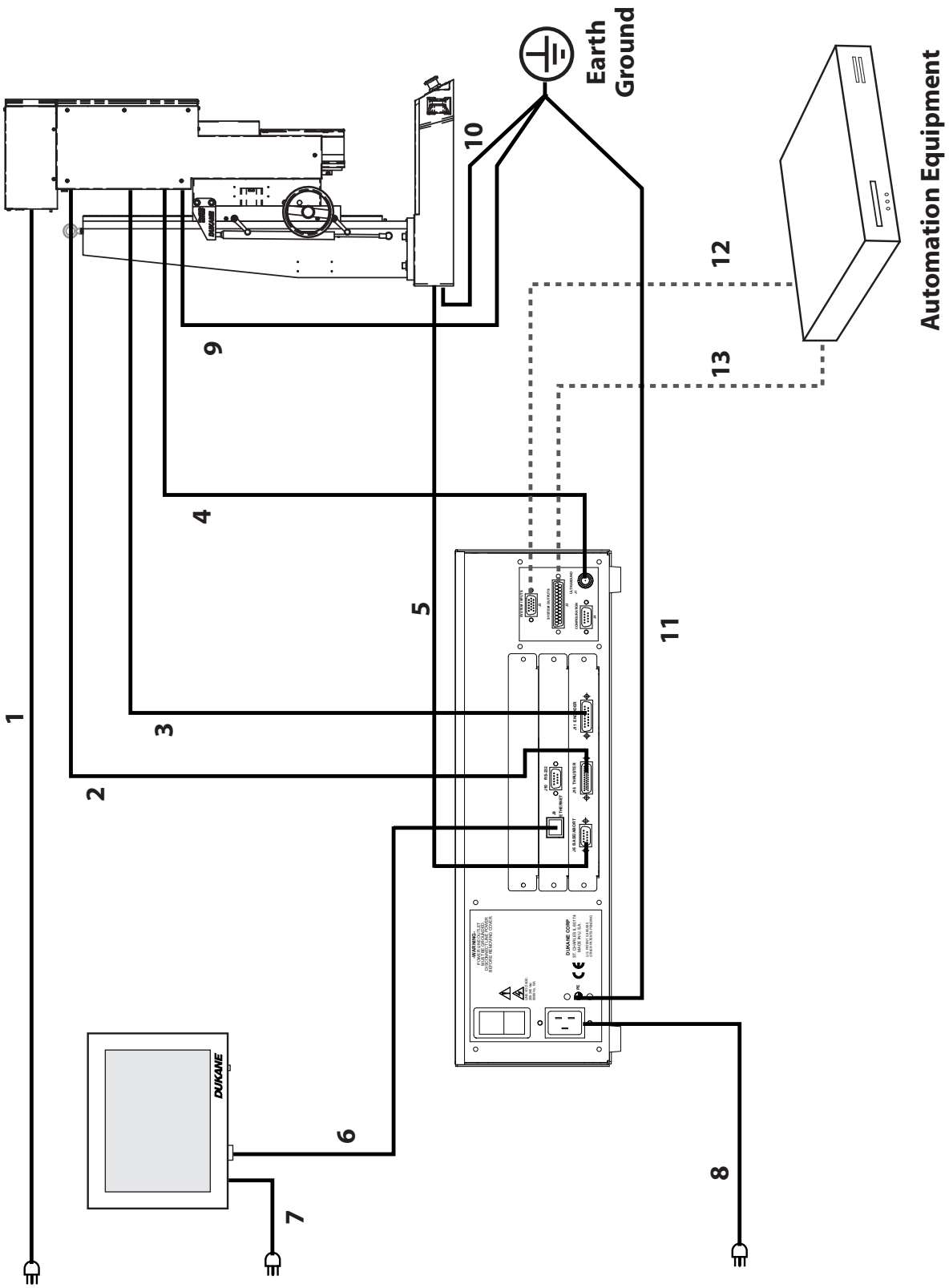


Figure 3-17 *iQ* Generator and Servo Press/Thruster - Connections Diagram *Continued*

Servo Press/Thruster (Version 2) *Continued from previous page*

Cable No.	Part Number	Length	Connections			
			Generator	Base	Thruster	HMI
1	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	AC INPUT	-
2	200-1556-XXM	XX	J15	-	SERVO I/O	-
3	200-1613-XXM	XX	J11	-	ENCODER	-
4	200-479-XXM	XX	J1	-		-
5	200-1545-XXM	XX	J6	J35	-	-
6	200-1553-XXM	XX	J9	-	-	ETHERNET
7	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	AC INPUT
8	One of the following: 200-1110 (240 VAC, 15A, US) 200-1111 (240 VAC, 16A, Europe) 200-1612 (240 VAC, 15A, India) 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) (for 120 VAC models, power cord is integral to generator)	2.4	AC INPUT	-	-	-
9	200-1557	5	-	-	PE	-
10	200-1557	5	-		-	-
11	200-1557	5	PE	-	-	-
12	200-1380-XXM	XX	J2	-	-	-
13	200-1381-XXM	XX	J3	-	-	-

Table 3-VII *iQ* Generator and Servo Press/Thruster Cables

Networking

Where several welders are connected, please refer to the ***iQ Explorer*** *User's Manual*, 403-579-00, Section 5 - Multiple Welder Connections.

After some introductory material, there is information about:

- Simple Stand-alone Configuration
- Unique IP Address, and
- Connection to Local Area Network

Recheck Connections

Recheck all cabling connections for the:

- ***iQ*** ES Generator
- Remote Controller
- Press/Thruster
- Connections to Local Area Network

Connect AC Power

When all cabling connections have been made, and they have been systematically rechecked, connect AC line power to your system.

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SECTION 4

Operation

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Overview

The ***iQ Series*** generator, model ES, is usually part of a system.

Main components of the system are:

- ***iQ*** generator,
- ***iQ Explorer*** (software),
- ***iQ Explorer*** User Interface (HMI),
  or computer (*user supplied*), and
- ***iQ*** Press System.

.

With this type of system, the user controls nearly all aspects of the welding process with the ***iQ Explorer*** User Interface (HMI) or a computer (*user supplied*), using ***iQ Explorer***. In addition the press, acoustic stack and any tooling are adjusted as necessary.

For additional information about the other key Dukane components of the system, see these User Manuals:

- ***iQ Explorer*** (Part No. 403-579-00), *and*
- ***iQ*** *Press System ES* (Part No. 403-569-00).

Start-up

The main power switch for the ***iQ Series*** generator is found on the generator's rear panel. When that switch is in the ON position, the front panel power button is RED (standby). When the front panel power button is pressed, the button color changes from RED to GREEN.

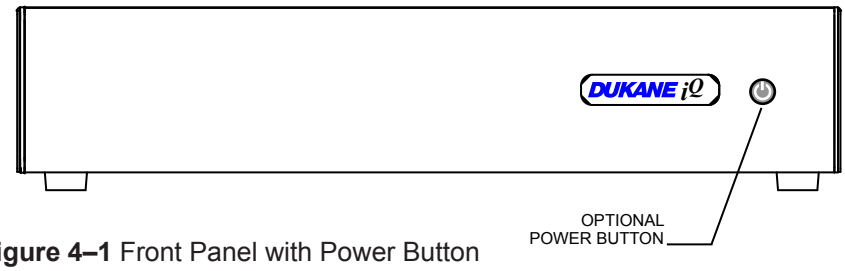


Figure 4–1 Front Panel with Power Button

Other Control Functions

Other control functions - such as monitoring the welding process and controlling the system are accomplished using the ***iQ*** HMI or your computer and Dukane's ***iQ Explorer*** software.

Stopping the Weld Cycle

Normal Conditions

The cycle stops when the programmed welding cycle ends or when the rear panel's Cycle Stop input is activated.

Emergency Conditions

If the generator's front panel power button is lighted, press the button so that the light goes out.

In addition, you may push the power switch on the generator's rear panel to the OFF position.

iQ Explorer Support Features

Two support features incorporated into your ***iQ Explorer*** software are its virtual numeric pad/keyboard and its help system.

Numeric Pad and Keyboard

NOTE

iQ Explorer provides a touch screen numeric pad and a keyboard for easy parameter entry.

Select A for the keyboard.

Select 1 for the numeric pad.

Figure 4-2 shows the numeric pad.

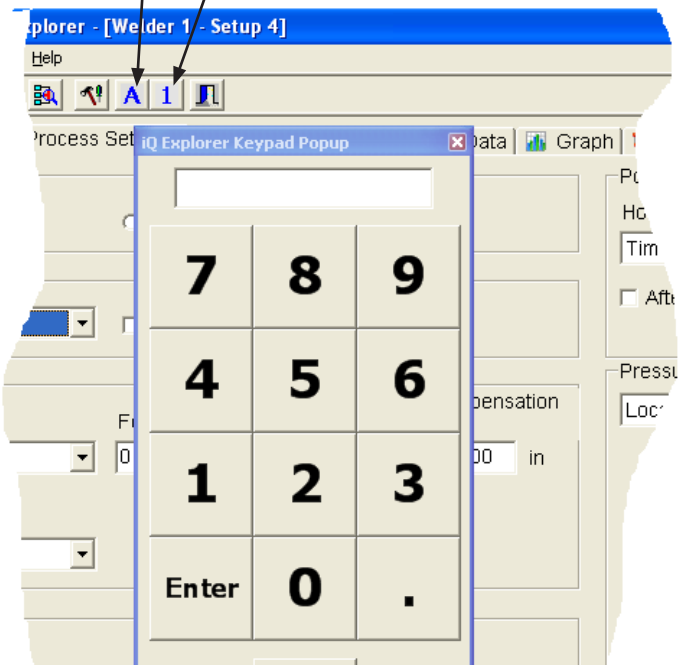


Figure 4-2 iQ Explorer, Numeric Pad

Help System

The help system is a reference tool to assist in understanding key terms of the ultrasonic welding process.
The ***iQ Explorer*** help function can be accessed using the top menu bar, or by pressing the F1 key as explained below.

Top Menu Bar

Help is one of the top menu bar items as shown in Figure 4-3.

Clicking on **Help** and then clicking on **iQ Explorer Help** will open the **Help** window.

Figure 4-3 Help from Top Menu Bar

A **Contents** tab and an **Index** tab are two entry points to the help file information.

Contents groups the help file information into these seven categories:

1 - Hardware
2 - Process Control
3 - Process Limits
4 - Graph
5 - Utilities
6 - System
7 - Options

The **Index** is an alphabetical list of words and phrases.

Figure 4-4 illustrates that the term, Trigger was found through both **Contents** and the **Index**.

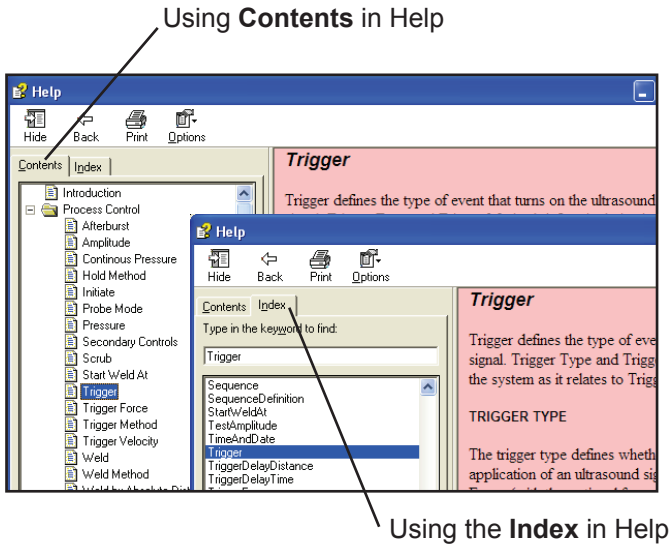


Figure 4-4 Contents and Index in Help

Using the F1 Key

The F1 key can be pressed to activate **Help** when:
1) the cursor is positioned in an item that can be edited, such as a text box, drop down list, or check box and,
2) that item is linked to **Help**.

NOTE

If no keyboard is available - perhaps you are using a touchscreen. Use the iQ HMI Windows keyboard, or press Help in the top menu bar, and navigate to the desired topic.

Quick Start - *Servo* Welder

Servo Step 1 - Read *Section 3, Installation* of the *iQ Explorer User's Manual*

403-579-00. Insure that proper connection of the ***iQ Explorer*** software and the servo press are in place. See Figure 4-5 below.

It is important that you understand and familiarize yourself with the operation and navigation of the ***iQ Explorer*** user interface software. Be familiar with ***iQ Explorer*** *User's Manual - Section 4, Operation.*

Pneumatic Welder
Quick Start
See Pages 56-69

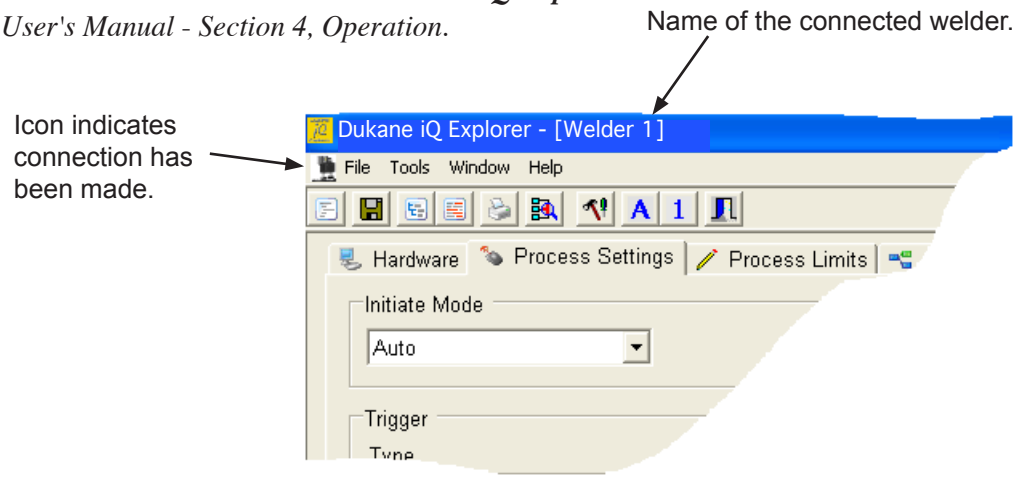


Figure 4-5 iQ Explorer, Start-up

Servo Step 2 - Hardware Tab

After moving to the Hardware tab, click on the Setup File Name box, and select an unused setup. This will ensure that you do not overwrite a pre-existing setup.

See Figure 4-6 below.

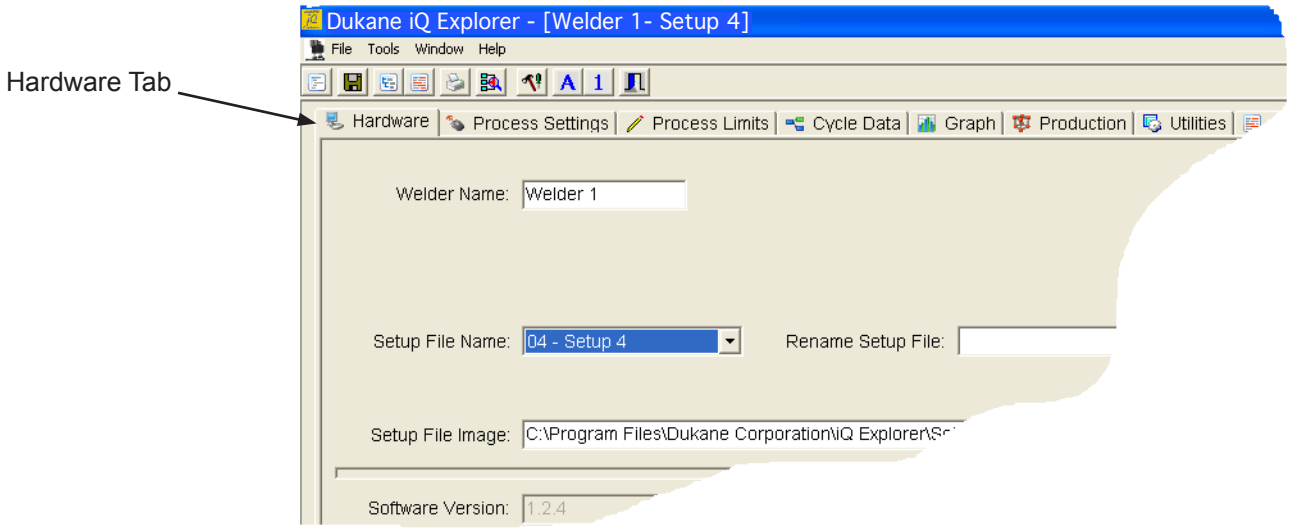


Figure 4-6 iQ Explorer, Start-up, Hardware Tab

Servo Step 3 - Navigate to the Process Settings Tab

See Figure 4-7.

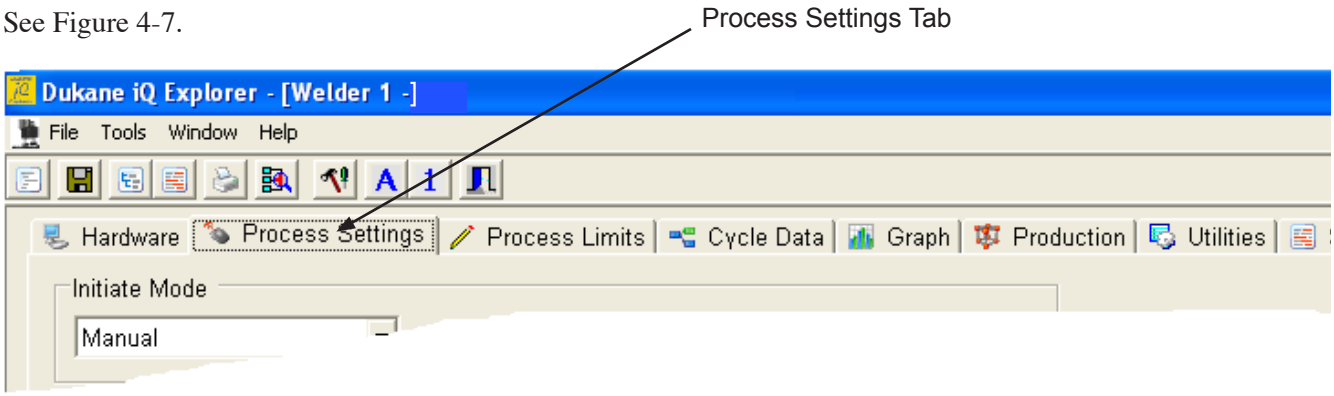


Figure 4-7 iQ Explorer, Process Settings

Servo Step 4 - Process Settings > Initiate Mode > Manual

See Figure 4-8.

NOTE

This Initiate Mode selection assumes there is a stand-alone, benchtop system with manual activation switches.

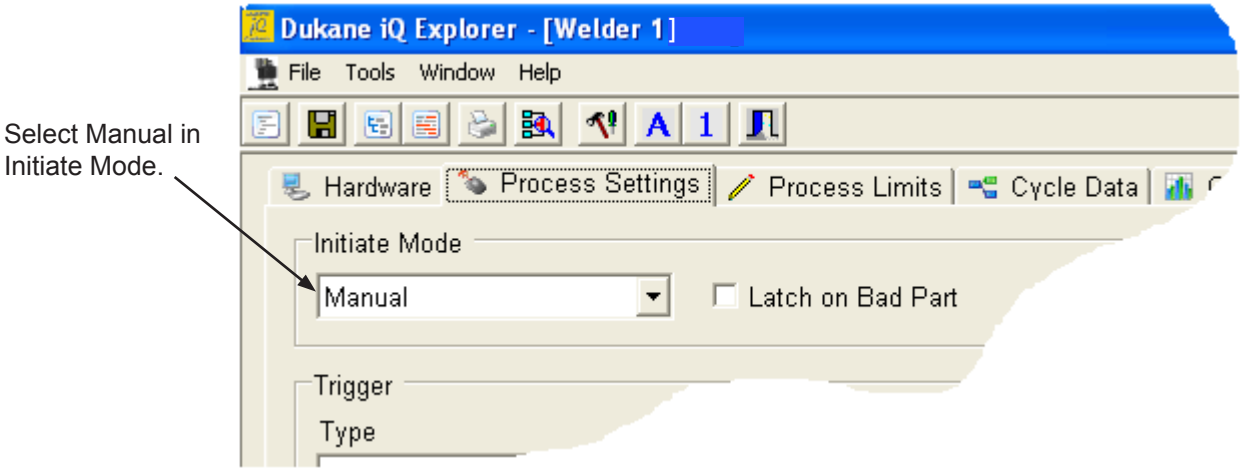


Figure 4-8 iQ Explorer, Process Settings > Initiate Mode

Servo Step 5 - Process Settings > Trigger > Type

Select Force as the type of trigger.

Then program the desired pounds of force.

Next, program Max Trigger Time. This provides a measure of safety insuring the welder will fault if for some reason the welder never achieves the programmed trigger force. See Figure 4-9.

NOTE

The example shown in Figure 4-9 assumes trigger force for a part with four linear inches of weld would need between 32 - 42 lbs of trigger force A 20 inch linear weld may require between 52 - 70 lbs. of trigger force. See Figure 4-10, Initial Trigger Force Settings.

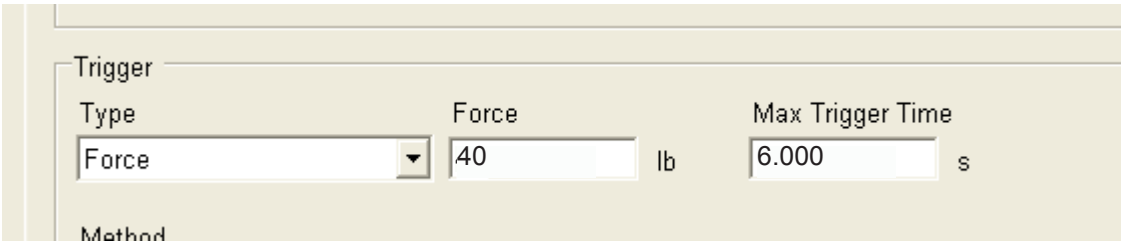


Figure 4-9 iQ Explorer, Process Settings > Trigger > Type > Force > Max Trigger Time

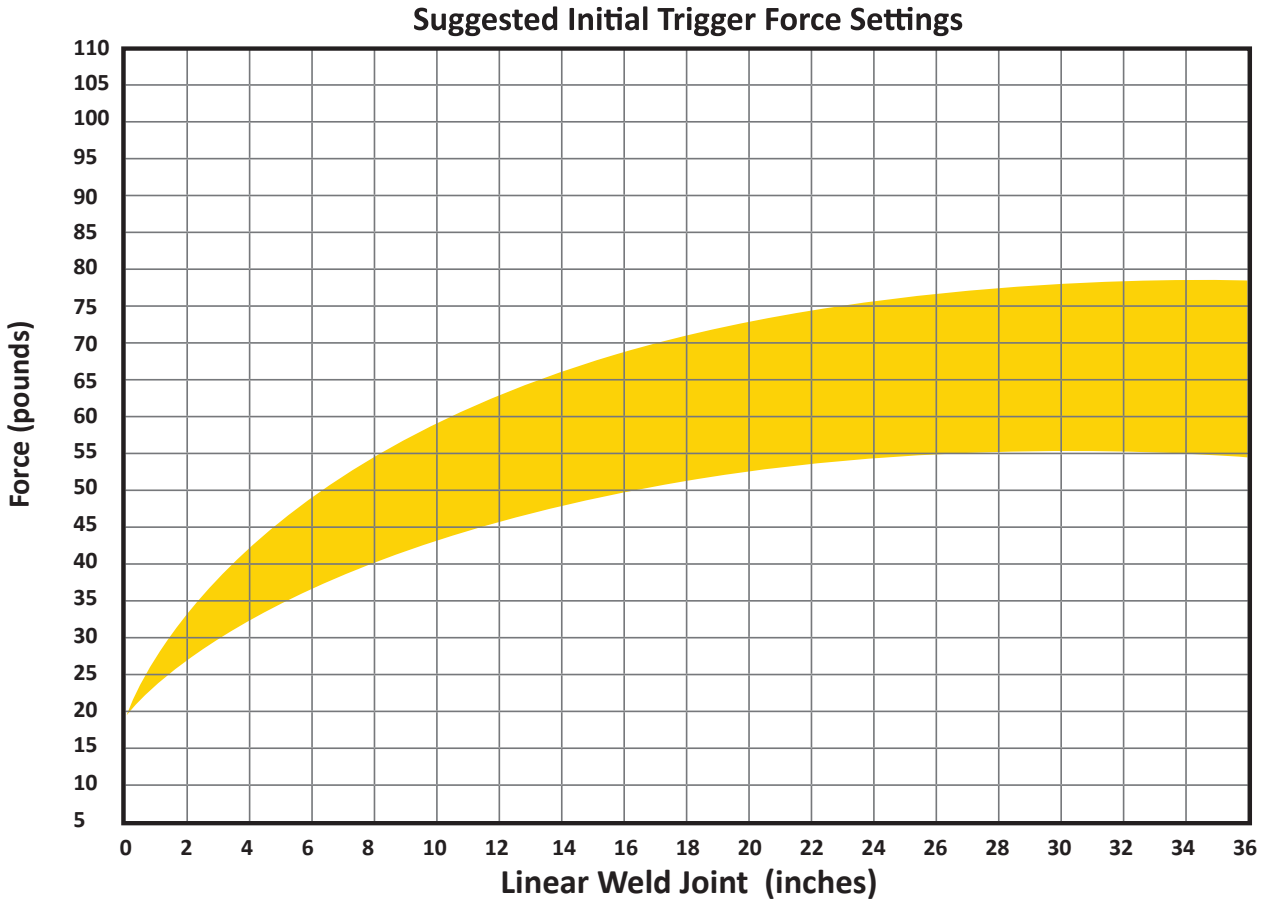


Figure 4-10 Suggested Initial Trigger Force Setting

Servo Step 6 - Program Sensing Speed

On the Process Settings tab, find Sensing Speed.

This is the speed (inches per second) at which actuation will move during the approach just before reaching trigger position. Speed range is from 0.001 to 1.00 in/s (inches per second). (A typical base start speed is in the range of 0.20 to 0.40 in/s.)

This feature is exclusive to the servo-controlled systems and allows for precise, accurate trigger forces.

Servo Step 7 - Program Sensing Start Distance

See Figure 4-11. Sensing Start Distance is the actual position in the machine travel where motion changes to Sensing Speed. To program this distance, you must know how far the horn travels to come in contact with the top of the part to be welded. If you do not know this position where this contact is made, select the Teach button. See Figure 4-12 on the next page.

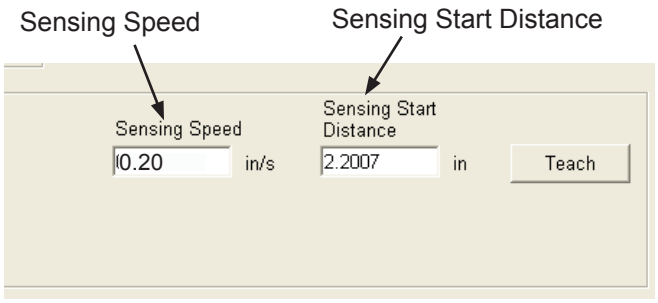


Figure 4-11 iQ Explorer, Process Settings > Sensing Speed

Servo Step 8 - Teach Start Sensing Distance

After pressing Teach, you will see a window similar to the one shown in Figure 4-12.

Place an unwelded part into the fixture. Press both opti-touch activation switches to jog the horn down to within 0.010 - 0.030 inches above the part. The stroke position of the thruster will be shown in the Current Position box. Once you are at the desired position, press Set to program that distance. Select Exit, and follow instructions to Home the machine.

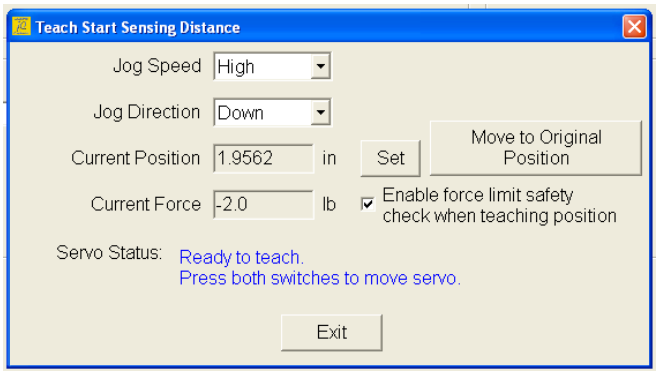


Figure 4-12 iQ Explorer, Teach Start Sensing Distance

Servo Step 9 - Select Trigger Method

Still on the Process Settings tab, select Normal as the trigger method.

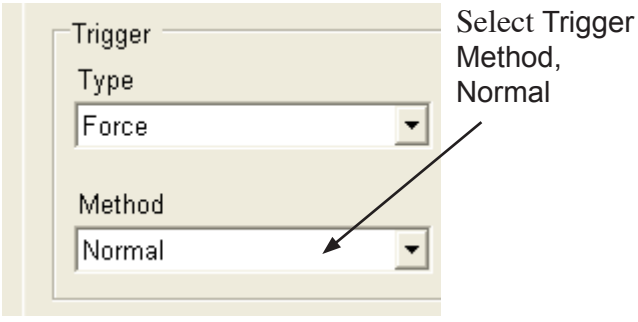


Figure 4-13 iQ Explorer, Select Trigger Method

Servo Step 10 - Program Weld Characteristics

On the Process Settings tab, select Weld > Method, Parameter, and Max Time.

Collapse Distance - The distance the welder advances once programmed trigger force is reached. Usually the distance is the height of the energy director, or shear joint of the part being welded.

Max Time - A secondary weld characteristic offering a measure of safety. If the programmed parameter is not achieved (as in the example shown in Figure 4-14) within 10 seconds, the system will fault.

NOTE

Programming these weld parameters is similar to programming the DPC IV Plus or other pneumatic systems. Weld methods are: Time, Collapse Distance, Absolute Distance, Energy and Peak Power.

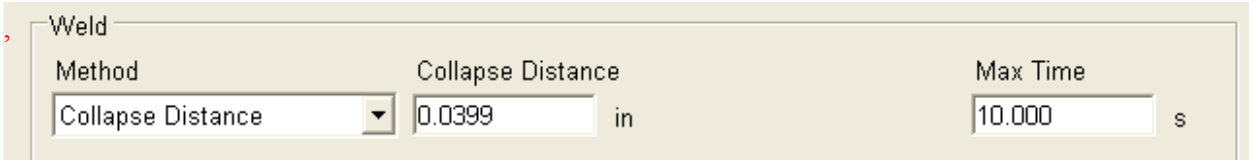


Figure 4-14 iQ Explorer, Weld > Method > Parameter > Max Time

Servo Step 11 - Program Start Motion After Force Decreases By:

Continuing with the Process Settings tab. . .
See Figure 4-15.
This patented feature is found only on Dukane's servo press systems. If the feature is selected, the system will stop motion once the desired Trigger Force is achieved. The ultrasound will be initiated at this moment. Once the programmed force drop is detected, the motion will continue. This is the basis for Dukane's exclusive Melt-Match™ technology.

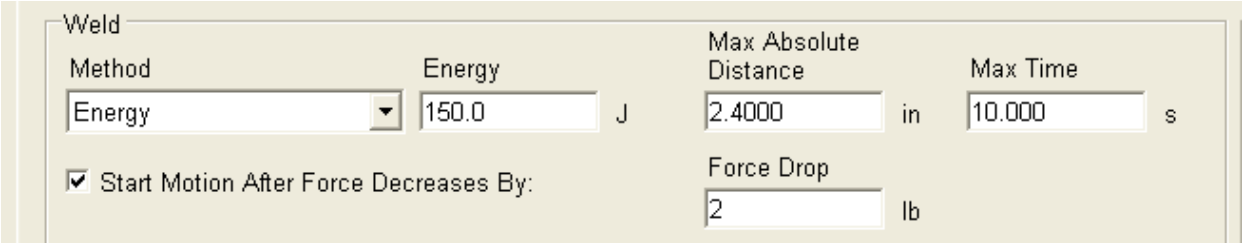


Figure 4-15 iQ Explorer, Start Motion After Force Decreases By:

Benefits - Figure 4-15 illustrates that motion of the thruster will not continue unless the system detects that the trigger force has decreased by 2 pounds. In theory, this force drop will occur as the plastic starts to melt. The benefit of this option is significantly less stress on the parts and stronger weld bonds.

Servo Step 12 - Select Motion Control Mode > Speed > Constant

Continuing with the Process Settings tab. . . This is the speed of the thruster during the weld cycle (after Trigger Sensing Speed and Motion Force Decrease have occurred). This motion feature is only available on servo-press systems. The speed range is from 0.001 to 1.0 in/s.
Motion Control Mode - Select Speed.
Motion Type - Select Constant.
Speed - Program speed. A typical initial setting range for a standard energy director might be 0.010 to 0.060 in/s.

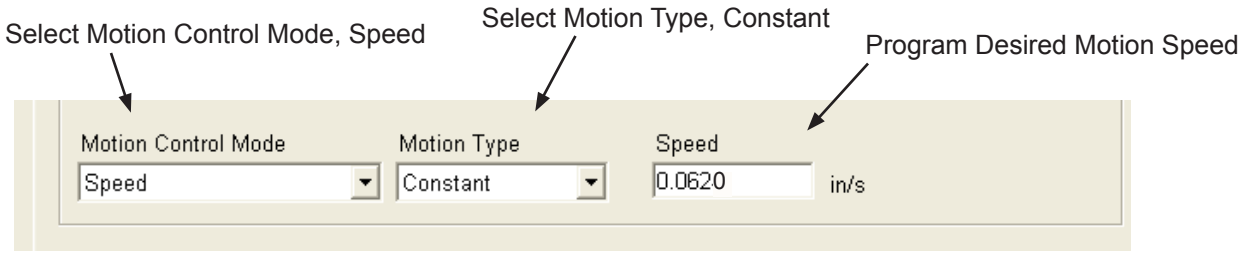


Figure 4-16 iQ Explorer, Motion Control Mode, Speed

Advanced Users - NOTE

Advanced users will optimize the Motion Speed using Profile to produce superior weld strength and excellent cosmetic appearance. See Figure 4-17 where Profile was selected as the Motion Type.This feature allows creating a speed motion profile during the weld cycle. The speed motion profile can be created to match the actual melt collapse of the weld joint.

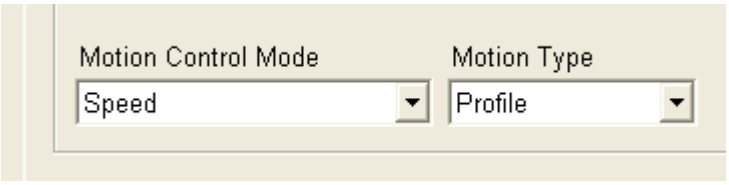


Figure 4-17 iQ Explorer, Speed, Motion Type, Profile

Optimizing the Feature
The easiest way to make best use of this feature is to optimize the power draw throughout the weld cycle. This can be done by manipulating the Speed Profile until the Power Graph shows a smooth, constant result.

See Figure 4-18 at right for a view of a Speed Profile.

View Speed Profile
Selecting View Speed Profile brings up a screen like one shown below.

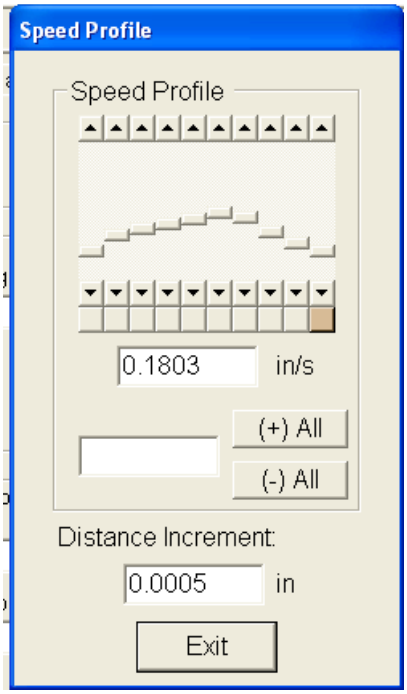


Figure 4-18 iQ Explorer, View Speed Profile

Servo Step 13 - Set Amplitude

Continuing with the Process Settings tab. . . A typical initial amplitude setting is 100%. The range for this feature is between 20% and 100%.

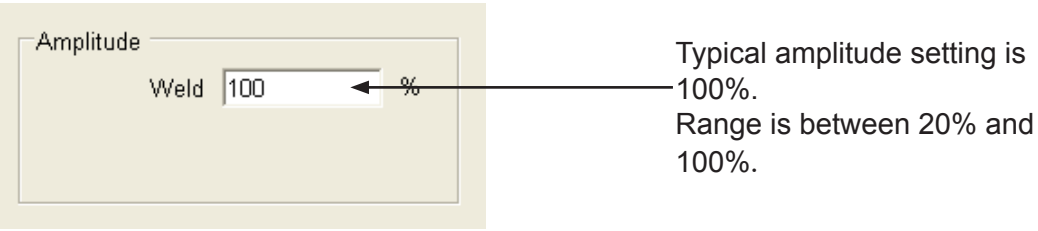


Figure 4-19 iQ Explorer, Amplitude Setting

Continue with Post Weld *settings on the next page.*

Servo Step 14 - Post Weld Settings

Continuing with the Process Settings tab. . .

The post weld phase of the process is often overlooked, however it is important in achieving desired weld results. The ***iQ*** Servo Welder has several exclusive post weld control parameters that can improve weld bond strength and process repeatability.

Hold

There are two types of hold - Dynamic Hold and Static Hold. These types can be used together or separately.

Dynamic Hold Method

During Dynamic Hold, with Collapse Distance enabled, the actuator will continue to travel the programmed collapse Distance at the programmed speed with the ultrasound signal turned off.

This occurs immediately after the weld phase. This unique feature provides the ability to collapse the molten plastic after the ultrasonic signal is turned off, before material solidification. This feature can be beneficial in producing superior weld strength and appearance.

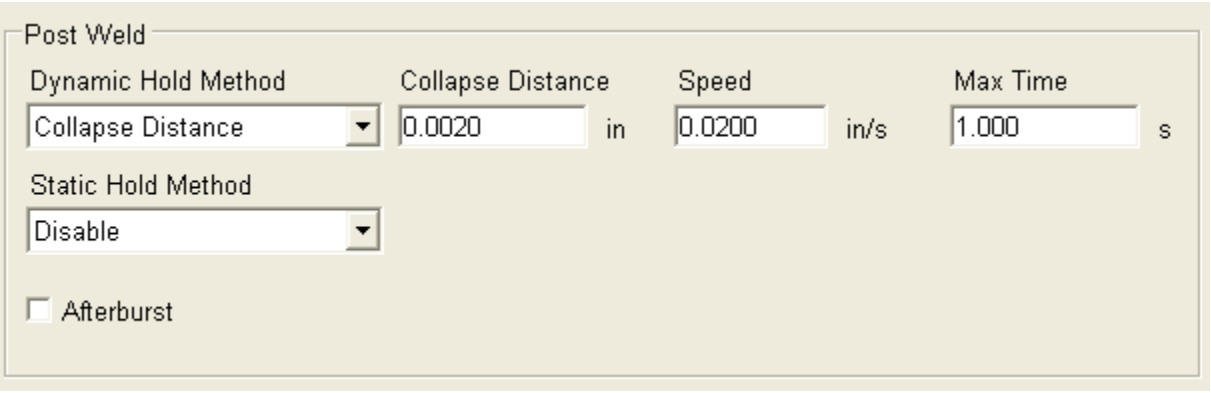


Figure 4-20 iQ Explorer, Process Settings> Post Weld > Dynamic Hold Method

Continued

Hold

Continued from previous page

Static Hold Method

If Time has been enabled in the Static Hold Method, the actuator motion will stop at the end of the weld cycle for the programmed interval (Hold Dwell Time). When the interval is ended, the actuator motion changes so that it goes upward and travels to the Home position.

This unique feature allows for superior consistency on overall part height. This is unlike a pneumatic press that continues to compress the part during the hold phase. In addition, Static Hold can contribute to stronger weld bonds. See Figure 4-21 below.

Figure 4-21 iQ Explorer, Process Settings> Post Weld > Static Hold Method

Servo Step 15 - Test the Acoustic Stack

Run a test of the acoustic stack.

Please go to Section 5 of this User's Manual, *System Operational Testing*, where the system test procedures are outlined.

Servo Step 16 - Navigate to the Process Limits Tab

See Figure 4-22. For each limit that is important to your application, use the drop down menu, and select Display.

Those limits will be displayed on the Cycle Data screen, and this will be important for future diagnostics of the welder setup.

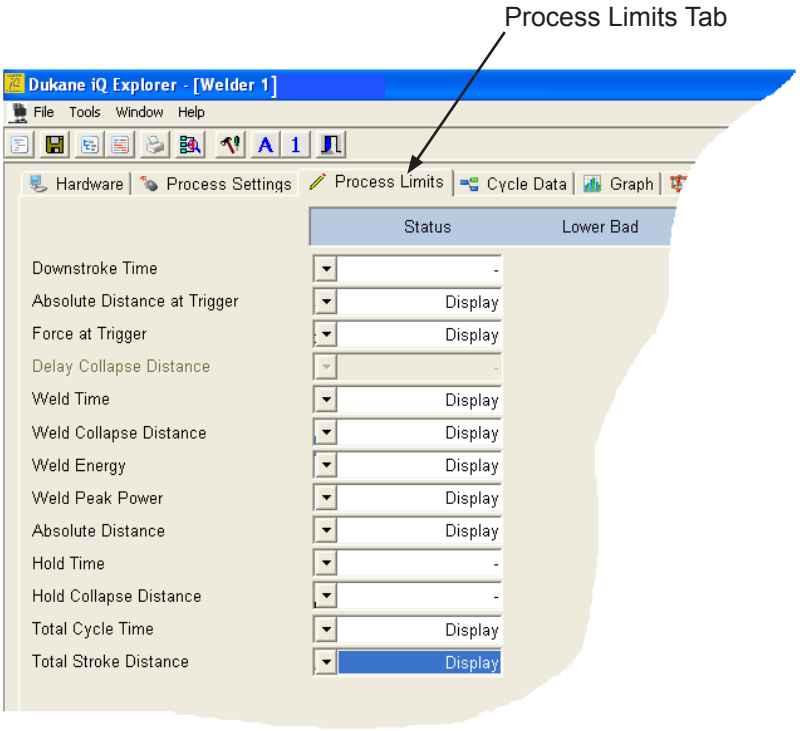
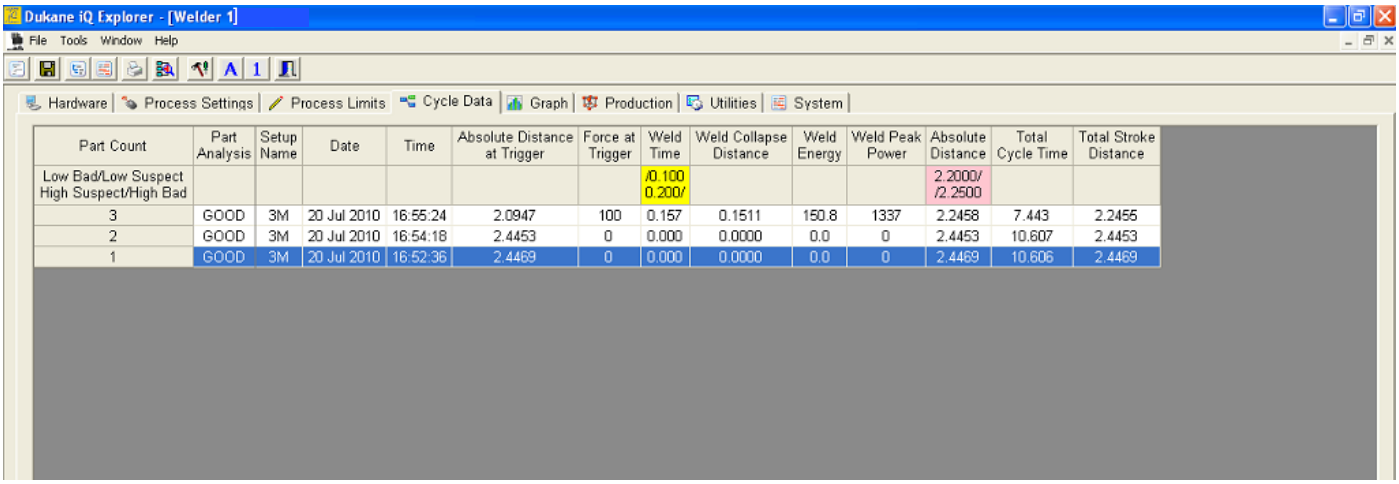


Figure 4-22 iQ Explorer, Process Limits Tab

Servo Step 17 - Cycle Data

After all the parameters have been programmed, initiate the weld cycle. View the results at the Cycle Data tab to insure all parameters have been achieved.

See the example shown below in Figure 4-23.



Part Count	Part Analysis	Setup Name	Date	Time	Absolute Distance at Trigger	Force at Trigger	Weld Time	Weld Collapse Distance	Weld Energy	Weld Peak Power	Absolute Distance	Total Cycle Time	Total Stroke Distance
Low Bad/Low Suspect High Suspect/High Bad							/0.100 0.200/				2.2000/ /2.2500		
3	GOOD	3M	20 Jul 2010	16:55:24	2.0947	100	0.157	0.1511	150.8	1337	2.2458	7.443	2.2455
2	GOOD	3M	20 Jul 2010	16:54:18	2.4453	0	0.000	0.0000	0.0	0	2.4453	10.607	2.4453
1	GOOD	3M	20 Jul 2010	16:52:36	2.4469	0	0.000	0.0000	0.0	0	2.4469	10.606	2.4469

Figure 4-23 iQ Explorer, Cycle Data

Quick Start - *Pneumatic Welder*

Pneumatic Step 1 - Read Section 4

of the ***iQ Explorer*** *User's Manual* 403-579-00. It is important that you understand and familiarize yourself with the operation and navigation of the ***iQ Explorer*** user interface software.

Insure that proper connection of the ***iQ Explorer*** software with the pneumatic press is in place. See Figure 4-24 and Section 3 of the ***iQ Explorer*** *User's Manual*.

Servo Welder Quick Start

See Pages 44-55

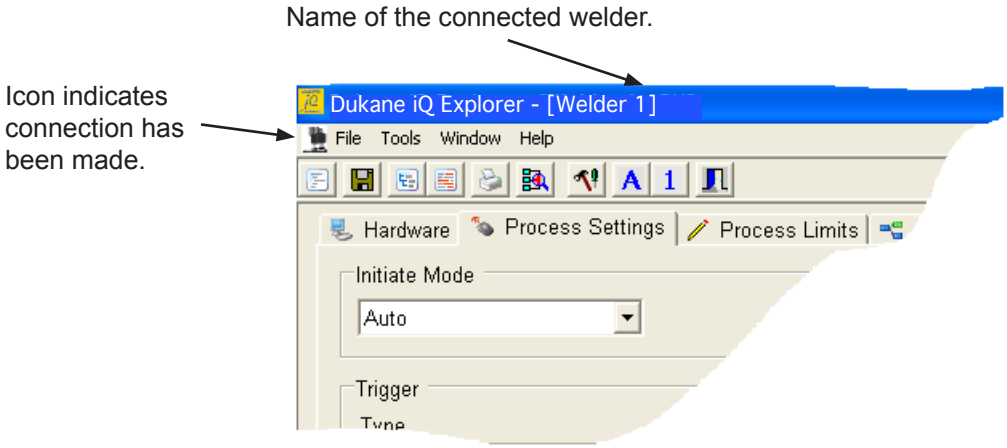


Figure 4-24 iQ Explorer, Start-up

Pneumatic Step 2 - Hardware Tab

After moving to the Hardware tab, click on the Setup File Name box, and select an unused setup. This will ensure that you do not overwrite a pre-existing setup.

See Figure 4-25 below.

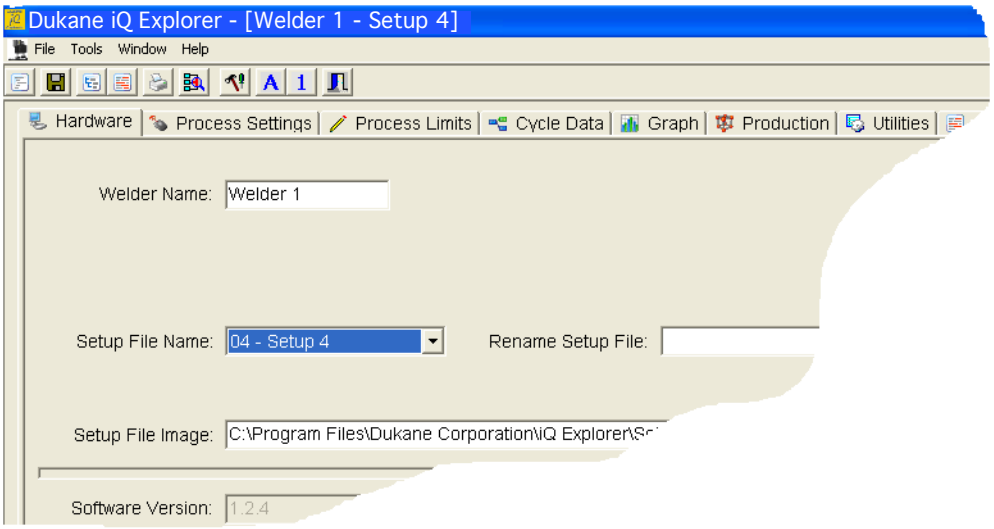


Figure 4-25 iQ Explorer Start-up, Hardware Tab

Pneumatic Step 3 - Process Settings

Navigate to the Process Settings tab. All welder setup related control parameters are programmed on this tab.

The Process Settings page is organized into 8 boxes:

1 - Welder Type
2 - Initiate Mode
3 - Trigger
4 - Weld
5 - Post Weld
6 - Pressure
7 - Amplitude
8 - Secondary Control

These boxes organize the weld process into the events that occur during the weld process.

Figure 4-26 shows the Welder Type selection.

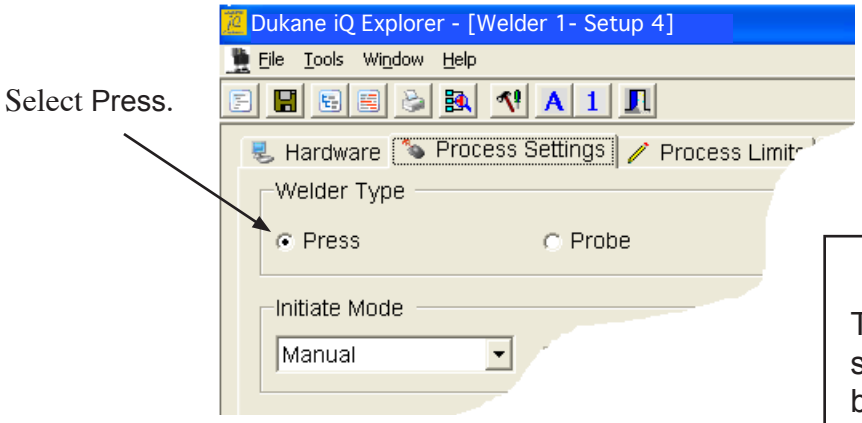


Figure 4-26 iQ Explorer, Process Settings>Welder Type

NOTE

This Initiate Mode selection assumes there is a stand-alone, benchtop system with manual activation switches.

Pneumatic Step 4 - Process Settings>Initiate Mode> Manual

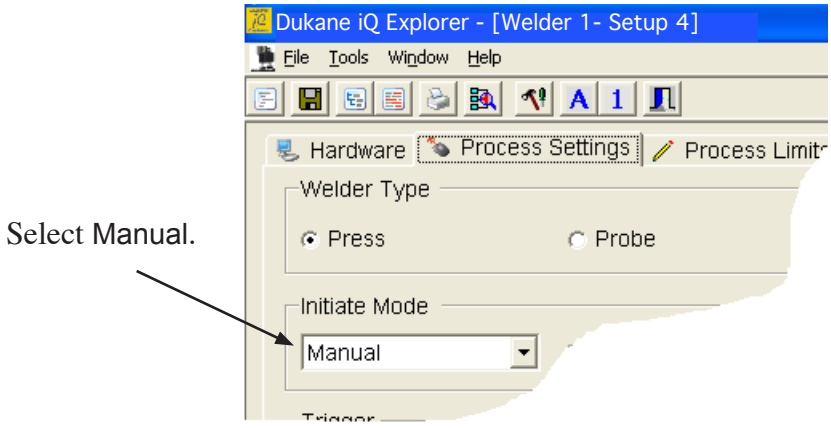


Figure 4-27 iQ Explorer, Process Settings>Initiate Mode> Manual

Pneumatic Step 5 - Process Settings>Trigger

Trigger Type - Select Force as the Trigger Type. Program a force value.
For this example we used values typical for welding an energy director part with approximately 10 inches of linear weld joint. This type of weld may need about 50 pounds of trigger force.
See Figure 4-28.

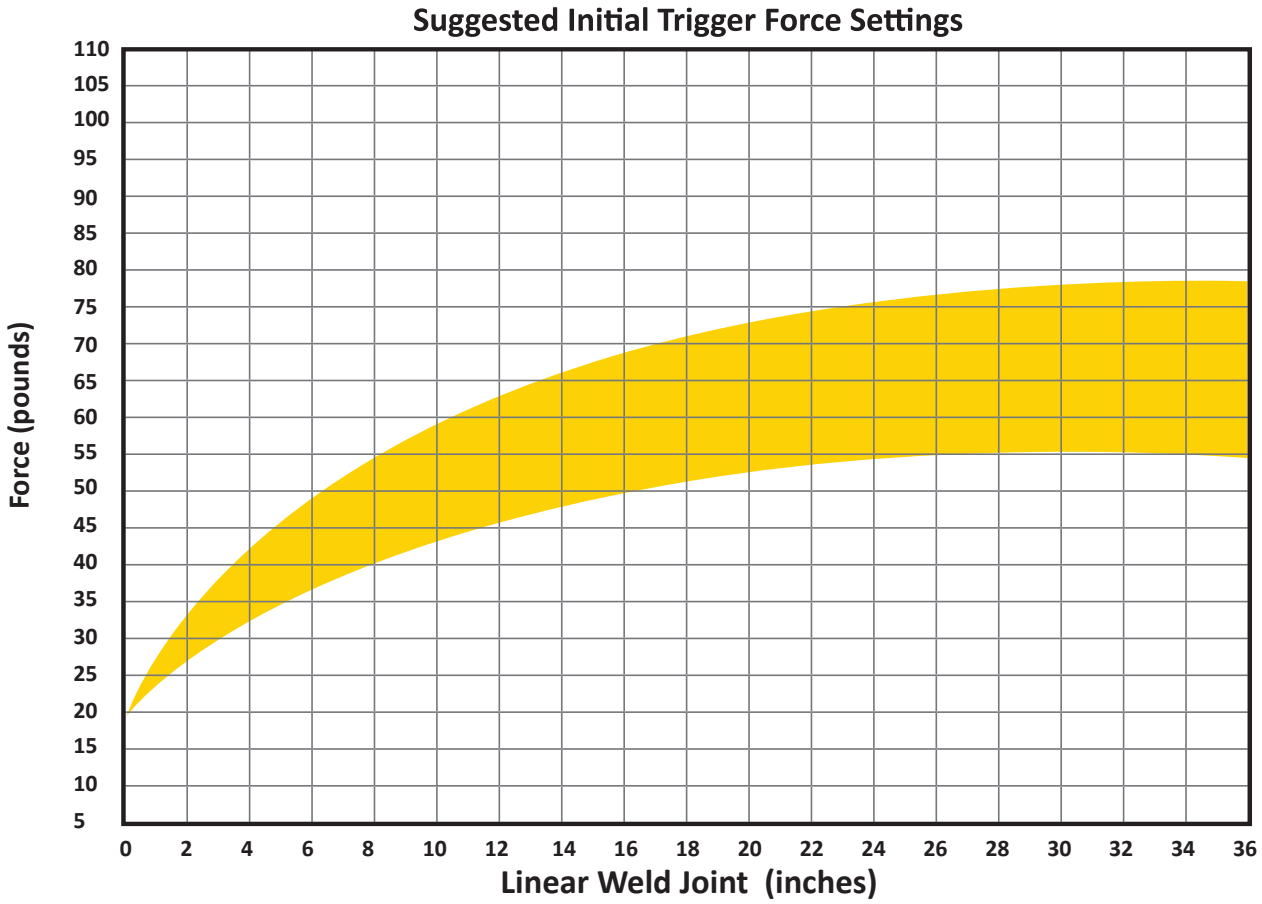


Figure 4-28 Suggested Initial Trigger Force

Max Trigger Time - Program a Max Trigger Time of 3 seconds. This is the allowable cycle time from weld initiation until the welder develops the programmed force. Max Trigger Time will time the cycle out should the machine, for some reason, not reach its programmed force value.

Compensation Point - For a basic setup this value can be programmed at zero. Typically force values above 10 pounds are programmed at zero.

See Figure 4-29 on the next page.

Continued

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Pneumatic Step 6 - Process Settings>Trigger>Type

Figure 4-29 below shows Trigger Type and the other example values discussed on the previous page.

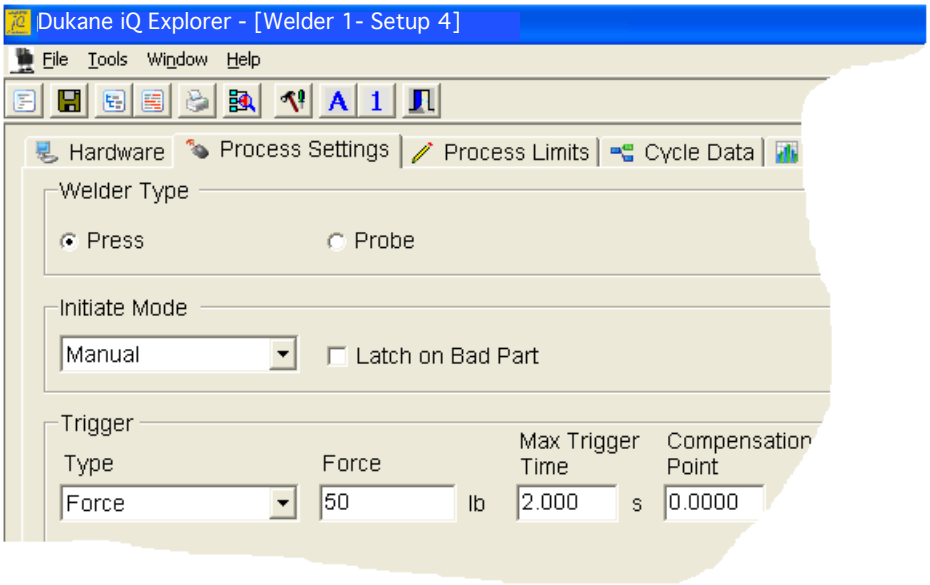

Figure 4-29 iQ Explorer, Process Settings > Trigger >Type

Trigger, Method - In the programming example here, we have chosen Normal.

Figure 4-30 below shows this selection.

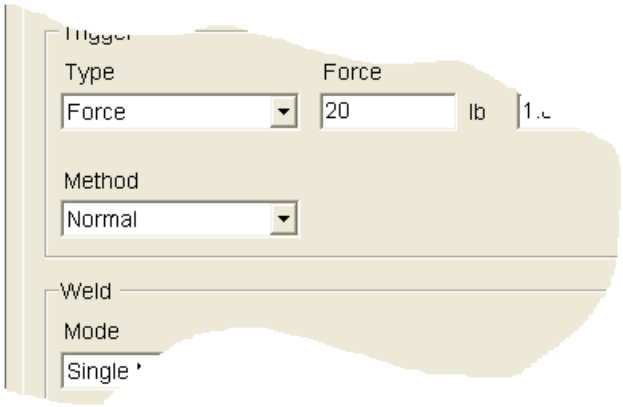

Figure 4-30 iQ Explorer, Process Settings > Trigger > Method

Pneumatic Step 7 - Process Settings> Weld

Mode - Select Single Method.

Method 1 - Select Collapse Distance. This is the distance the welder will advance once the programmed trigger force is achieved. Usually the distance is the height of the energy director, or shear joint of the part being welded.

Max Time - Max Time is a secondary weld characteristic offering a measure of safety. If the programmed parameter is not achieved (as in the example shown in Figure 4-31) within 2.000 seconds, the system will terminate the weld process.

NOTE

If the energy director or shear joint collapse value can not be determined, See Figure 4-32, and use Time as the initial basic setup.

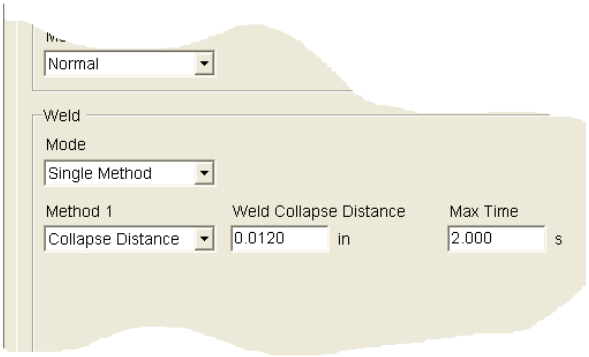

Figure 4-31 iQ Explorer, Process Settings > Weld

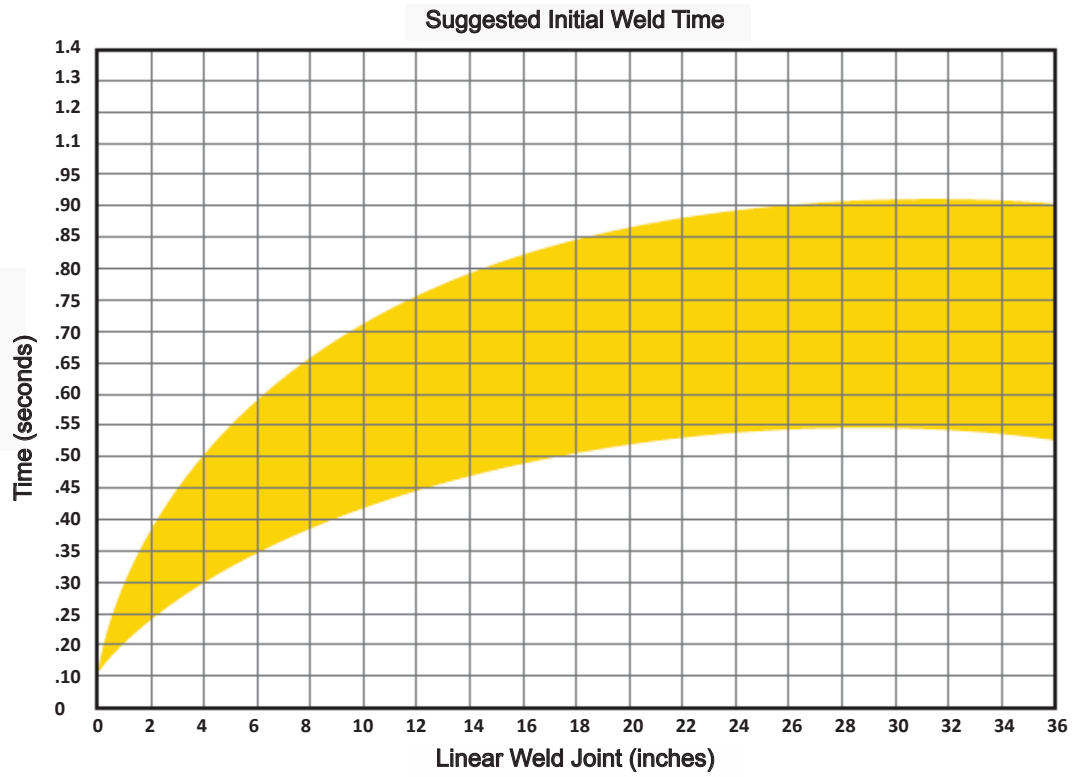

Figure 4-32 Suggested Initial Weld Time

Pneumatic Step 8 - Post Weld Settings

Process Settings > Post Weld > Hold Method

Select Time.

Program in a time of 0.500 seconds.

See Figure 4-33.

After the weld process (In this example setup, Collapse Distance has a programmed value.), the welder will shut off the ultrasound signal and continue to apply force for the programmed time.

This phase is important to insure the molten plastic created during the weld phase has a chance to solidify before pressure is removed from the part.

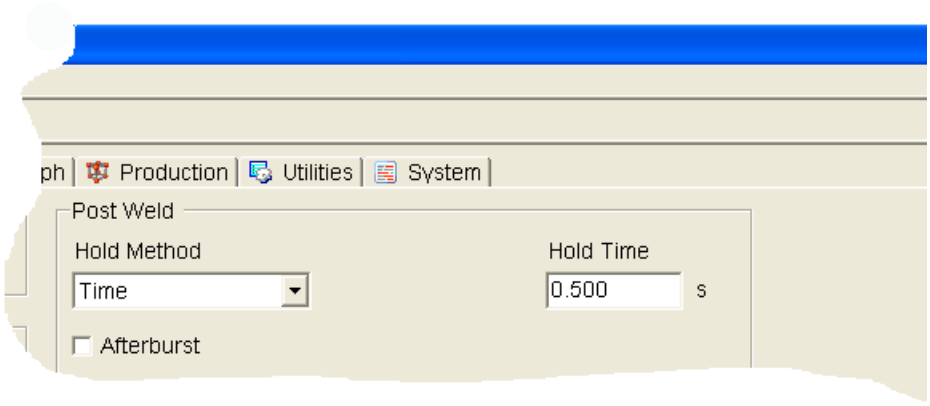

Figure 4-33 iQ Explorer, Process Settings > Post Weld > Hold Method > Hold Time

Continued

Pneumatic Step 9 - Process Settings > Pressure

For systems equipped with the Electronic Pressure Regulator option, weld pressure parameters need to be programmed in this section of the Process Settings page. See Figure 4-34.

Downstroke - This is the approach pressure before Trigger. For a basic setup, program a value here equal to Pressure 1.

Weld Pressure 1 - Program a pressure value based on the force requirement suggested in the Initial Weld Force chart. See Table 4-I and Figure 4-35.

NOTE

Downstroke pressure must be programmed so that enough force will be available to achieve the programmed Trigger Force. If there is not enough downstroke pressure, it may cause the system to fault at Max Trigger Time.

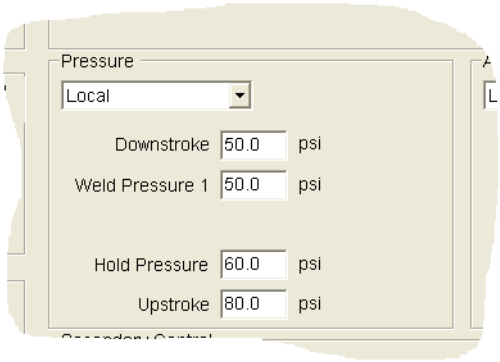

Figure 4-34 iQ Explorer > Process Settings > Post Weld > Pressure

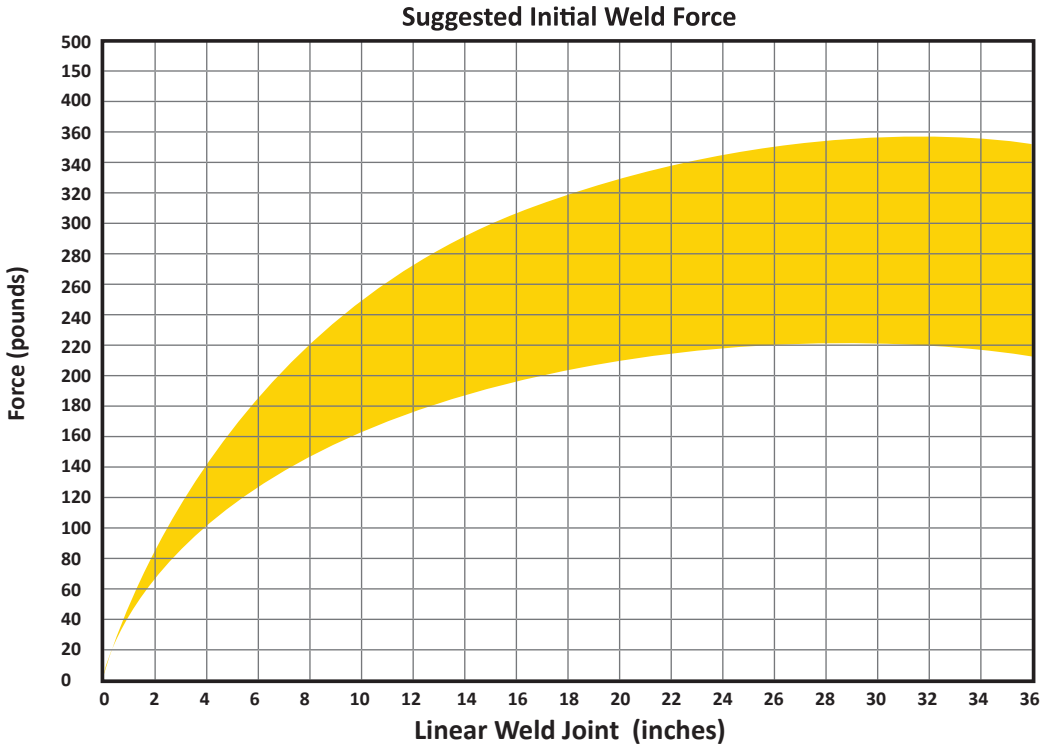

Figure 4-35 Suggested Initial Weld Force

Continued

Air Cylinder Size

Verify the size of your air cylinder diameter. Use Table 4-I to determine actual force at a given pressure.

Pressure (psi)	Cylinder Diameter (in)			
	1.5	2.0	2.5	3.0
0	0	0	0	0
5	9	16	25	35
10	18	39	49	71
15	27	47	74	106
20	35	63	98	141
25	44	79	123	177
30	53	94	147	212
35	62	110	172	247
40	71	126	196	283
45	80	141	221	318
50	89	157	246	354
55	97	173	270	389
60	106	188	295	424
65	115	204	319	460
70	124	220	344	495
75	133	236	368	530
80	142	251	393	566
85	150	267	417	601
90	159	283	442	636
95	168	298	466	672
100	177	314	491	707
105	186	330	516	742
110	195	345	540	778

Table 4-I Pounds of Force Comparison between Dukane Air Cylinders

Pneumatic Step 10 - Process Settings > Pressure *Continued from Page 62*

Hold Pressure - This pressure determines the amount of force applied during Hold.

Typical weld setups have Hold Pressure higher than programmed Weld Pressure.

Increasing hold force (pressure) during Hold helps to produce stronger weld bonds.

For a basic weld setup, program Hold Pressure at 10 psi above Weld Pressure. See Figure 4-34.

Upstroke Pressure - This pressure is applied at the end of the Hold time. This is the air pressure that drives the air cylinder to move the system back to its home position.

Upstroke pressure has little or no effect on weld results. However, overall cycle time is affected by upstroke travel time.

For a basic weld setup, program Upstroke Pressure at 80 psi. See Figure 4-34.

Pneumatic Step 11 - Process Settings >Amplitude

Amplitude - This refers to the peak-to-peak displacement of the horn at its workface. Amplitude settings are given as a percent of the horn's nominal amplitude in the range of 20% to 100%.

Select Local.

Then, at Weld, select 100%.

For a basic setup, leave Ramp Up Time and Ramp Down Time at 0.150 and 0.000 respectively (*the default settings*).

See Figure 4-36 below.

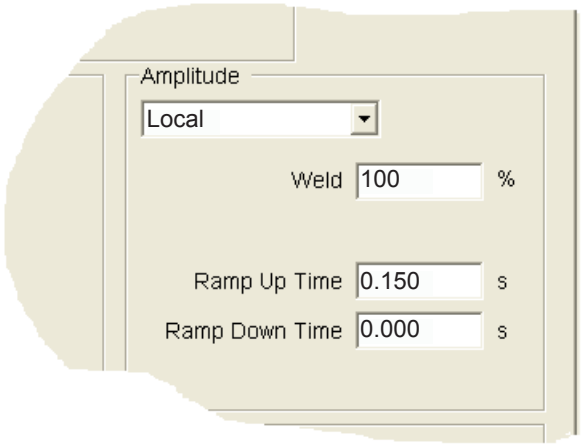

Figure 4-36 iQ Explorer, Process Settings > Amplitude

NOTE

Default settings for Ramp Up Time and Ramp Down Time are dependent on the frequency of the welding system.

Pneumatic Step 12 - Process Settings >Secondary Control

Secondary controls provide additional ways to end the weld portion of a cycle together with the primary control method specified.

This means control of the weld process can be accomplished either by the primary control or by one or more secondary controls.

Secondary control is not typically needed for basic setup.

See Figure 4-37 below.

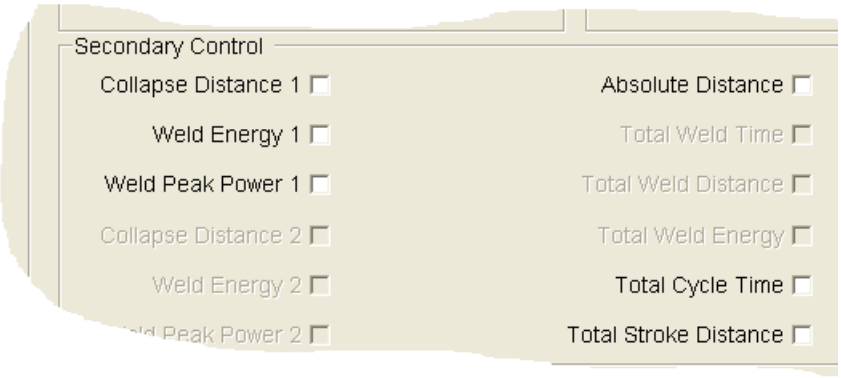

Figure 4-37 iQ Explorer, Process Settings > Secondary Control

Pneumatic Step 13 - Test the Acoustic Stack

Run a test of the acoustic stack.

Please go to Section 5 of this User's Manual, *System Operational Testing*, where the system test procedures are outlined.

Pneumatic Step 14 - Process Limits Tab

Navigate to the Process Limits tab.

If this is the first time on this tab (for your selected setup), the status for each parameter will be blank.

See Figure 4-38 below.

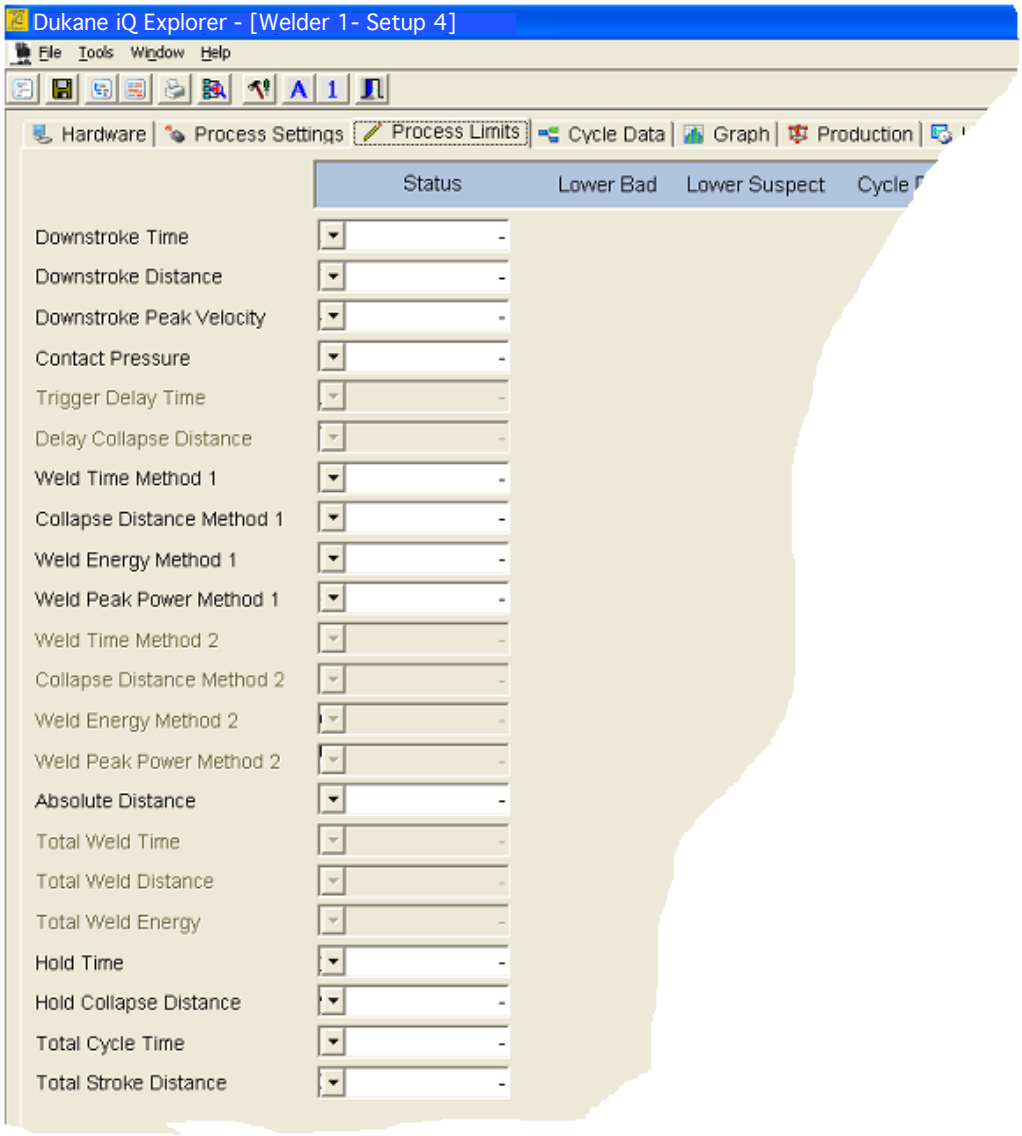

Figure 4-38 iQ Explorer, Process Limits Tab - I

Continued

Pneumatic Step 14 - Process Limits Tab *Continued from previous page*

Using the drop down menu for each limit that is important to your application, select Display. That limit will be displayed on the Cycle Data screen, and this will be important for future diagnostics of the welder setup.

Figure 4-39 shows a typical basic setup with several parameters selected.

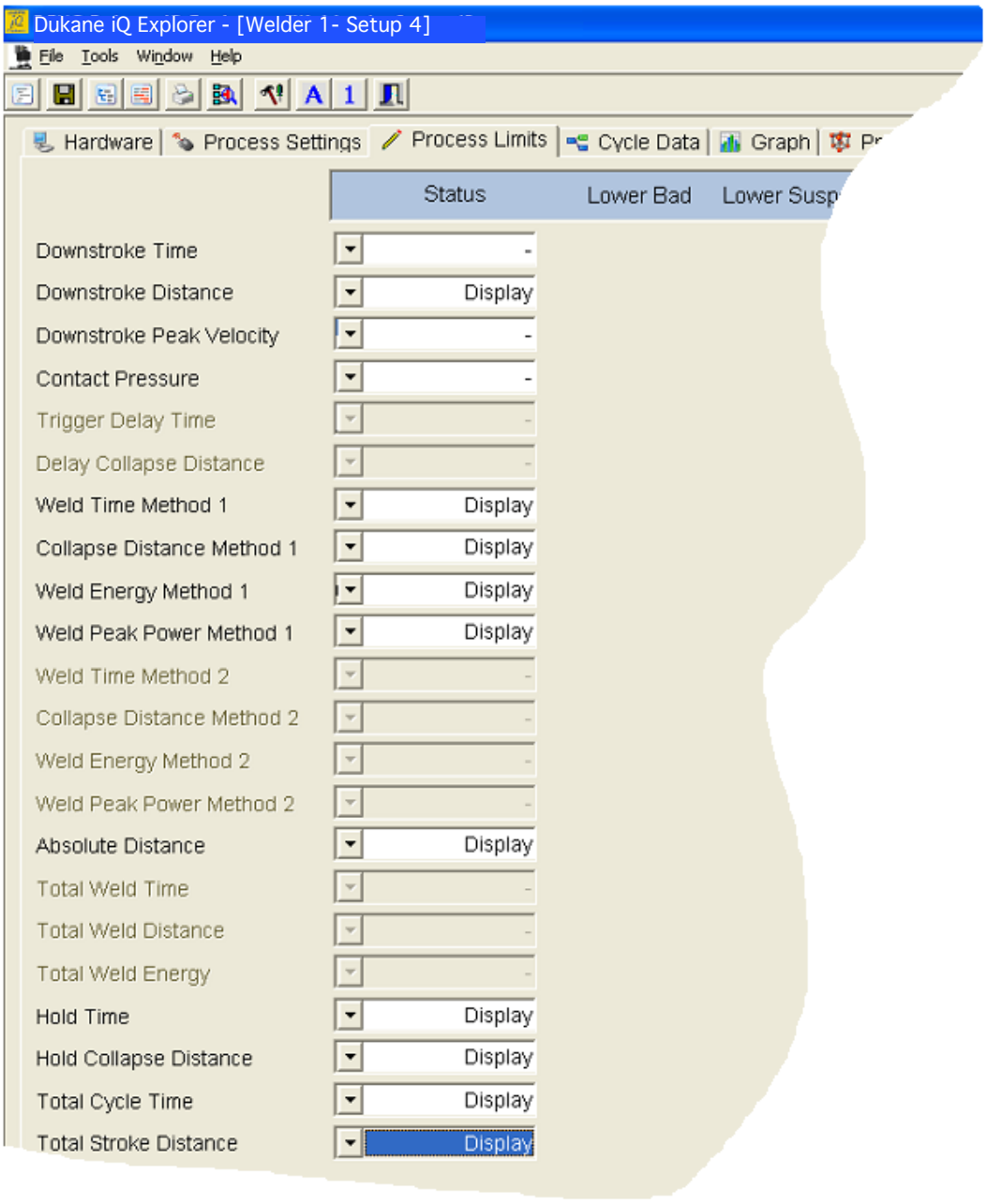

Figure 4-39 iQ Explorer, Process Limits Tab - II

Pneumatic Step 15 - Cycle Data

Navigate to the Cycle Data tab.

Begin a weld cycle using the cycle activation switches.

- Inspect the weld results of your finished part on the Cycle Data page.
- Review weld data to insure the process was done as programmed.
- Values for the completed cycle should be displayed under each programmed parameter.

Figure 4-40 below shows the top and bottom parts of the Cycle Data page. Because all of the parameters will not fit on one page, move the scroll bar (right and/or left) at the bottom to view the entire set of weld parameters.

NOTE

Use the scroll bar at the bottom of the Cycle Data screen to display all of the parameters.The bar moves the screen image right and left because a typical display will not show the entire set of parameters at once.

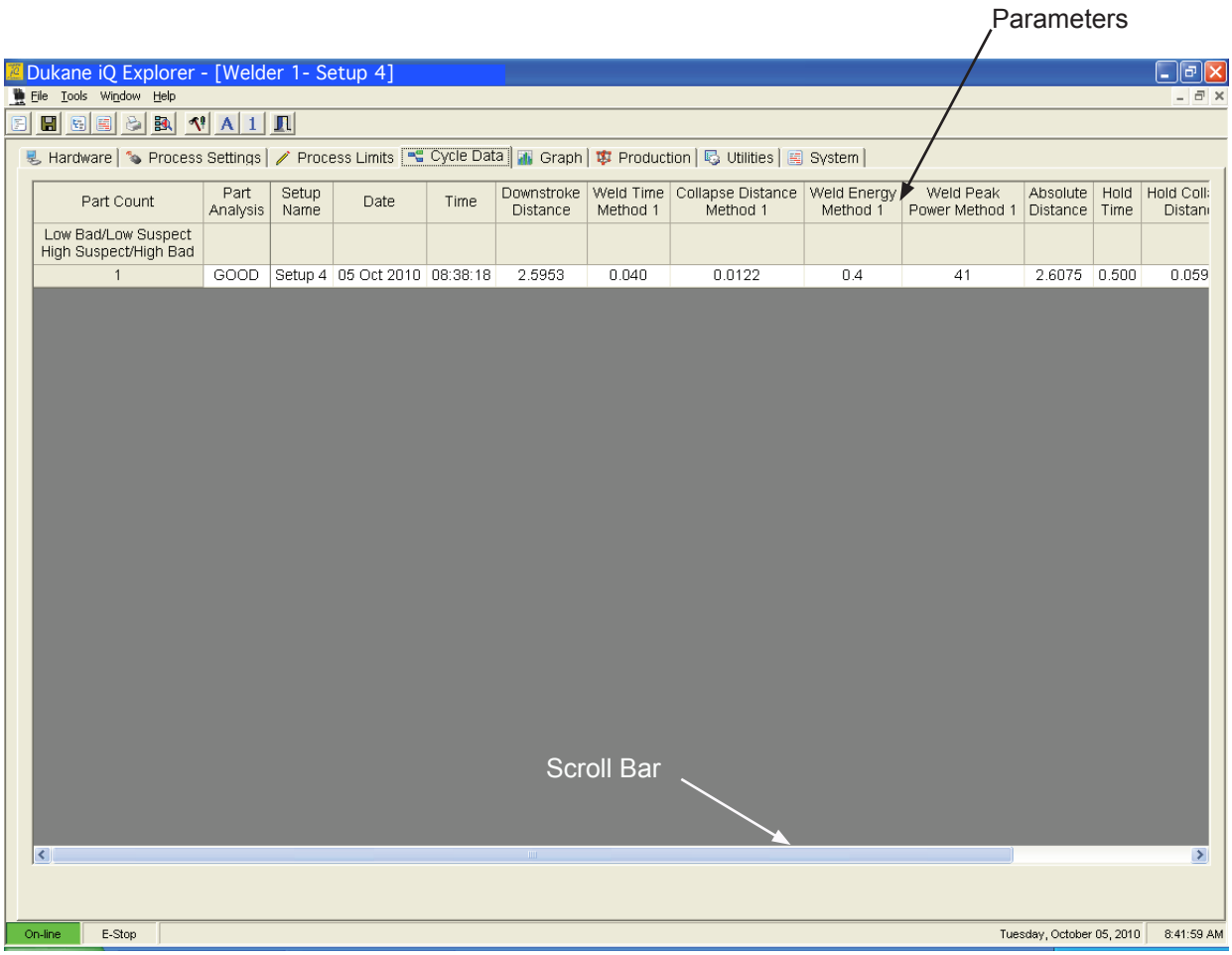

Figure 4-40 iQ Explorer, Cycle Data Page

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SECTION 5

System Operational Testing

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Overview

An ***iQ Series*** generator must be operating and connected to the press/thruster in order to test the system.

For efficient operation of a Dukane ultrasonic assembly system, the ultrasound signal from the generator must match the frequency and phase angle (vibrational characteristics) of the stack that is being driven. Each stack has unique vibrational characteristics dependent on the combination of stack components. In addition, the characteristics of a particular stack may vary slightly during operation because of temperature and loading factors.

To match the generator output signal with the characteristics of a particular stack, the generator output frequency is adjusted by Dukane's patented phase-locked-loop Digi-Trac pulse-width modulation circuitry.

The Digi-Trac feature automatically adjusts the ultrasound signal to match the vibrational characteristics of the stack being driven. When the ultrasound turns on during each operating sequence, the Digi-Trac circuit monitors the motion of the stack on a frequency cycle-by-cycle basis and adjusts the ultrasound signal for the optimum setting. Because the Digi-Trac continuously monitors each operating sequence, it compensates for vibrational changes that occur during repeated operations due to heating of the stack components. It also compensates for changes that occur over longer time periods due to aging of the piezo electric crystals in the transducer, or possible wear of the ultrasonic horn.

The Digi-Trac feature excels in environments hostile to reliable operation, such as high duty cycles or high stress, and continuous-duty applications. In such situations, the Digi-Trac circuit compensates for the unique vibrational characteristics of each stack due to differences caused by aging, loading, temperature changes, and differences in horn configurations.

Operational Test of the Acoustic Stack

The following test procedure is suggested before starting the generator, to verify that the vibrational characteristics of the stack fall within the range of the Digi-Trac. All Dukane stack components are manufactured to tolerance specifications within this range. A non-Dukane horn, an improperly assembled stack, or a stack component that is worn or damaged, can result in vibrational characteristics outside these specifications, and will require some adjustment. This test reveals the existence of any problems and directs you to corrective action.

1. Check the following:
   a. Make sure that the correct booster and horn for the application are installed in the thruster.
   b. Check the ***iQ Series*** system components for proper grounding.
   c. Check the ultrasound cable connections on the generator and thruster for proper seating and security.
   d. Verify that the horn is not under load (not in contact with a fixture or part).
   e. Verify that the REAR panel AC switch is ON. The front panel AC button should be RED.
2. Push the generator front panel power button to ON. The power button will start to flash RED on and off for LESS THAN 20 seconds. It will then turn GREEN. This indicates that the system is operating.

   If the power button display stops flashing but remains RED, do not go any further, there is a problem with the input circuit.
3. Using ***iQ Explorer***, go to the Utilities tab. Press the TEST button. See Figure 5-1.
   a. System Power Output:
      - If the power output display remains less than 20% of the power supply's rated output (See Table 10-III, Page 113.) and the horn frequency (ie: 220 Press) is within 19,500 Hz and 20,500 Hz, the stack is operational.
        (340 Press) within: 29,500-30,500 Hz, & 39,500-40,500 Hz.
      - If the power output exceeds the 20% indication, there may be a problem with the stack.

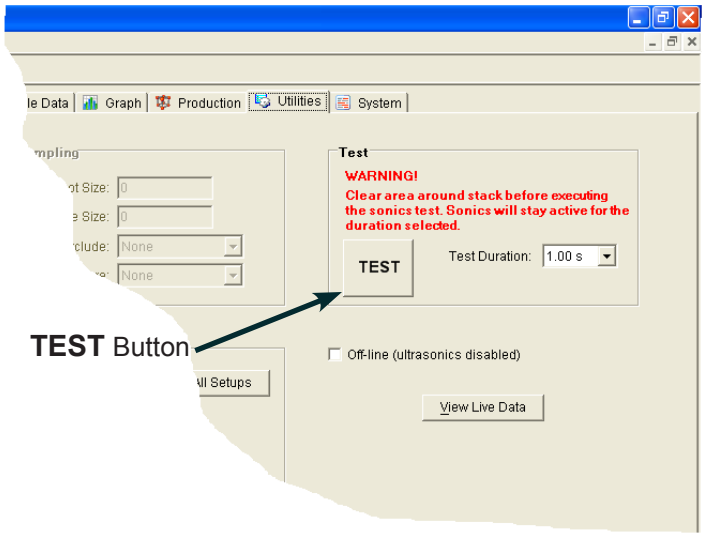

Figure 5-1 *iQ* Explorer Utilities TEST Button

Continued

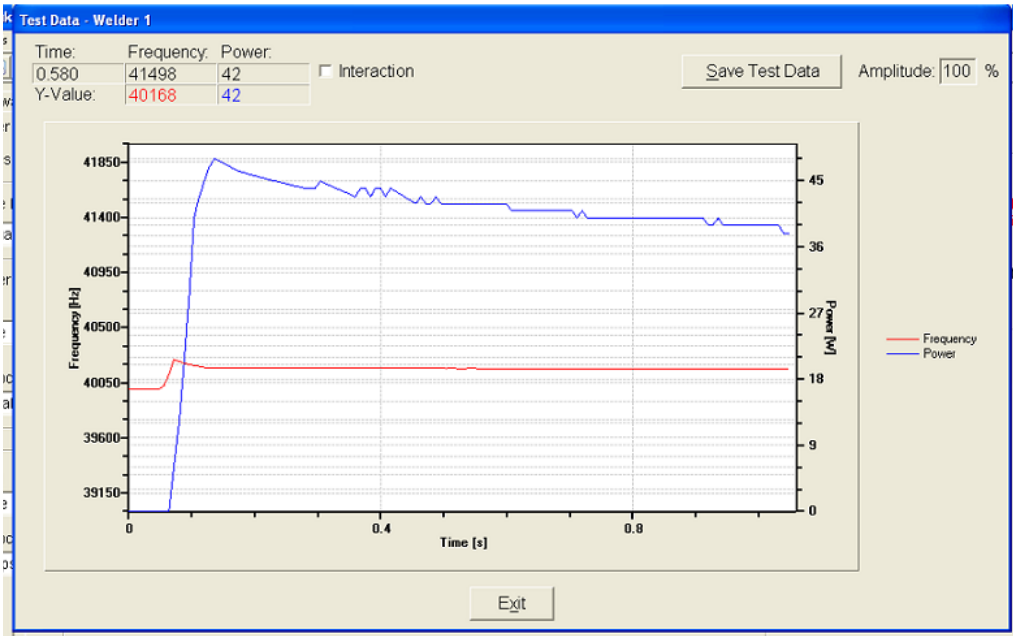

Figure 5-2 ***iQ*** Explorer TEST, Screen Display

Acoustic Stack Test *Continued from previous page*

b. If an overload fault is displayed, a mismatch has occurred between the generator's ultrasonic output signal and the stack.

Refer to the next section, ***Troubleshooting***, and see the Press Error Message tables.

Also see Figure 5-3 that shows an example of an error that caused cycling to stop.

4. While pressing the TEST button, lightly touch the side of the horn to check for ultrasonic vibrations. If any vibrations are felt, the stack is operational. If there is no vibration, there may be a problem with the stack.

If all the indicators pass their tests, the stack is within the Digi-Trac range.

The generator is operating at the optimum setting for this stack when the Watts displayed on the graph (after the test) is between 10 and 20 percent of the power supply's available output. The vibration amplitude of the horn and booster and the mass of the horn determine the amount of energy needed to vibrate the stack.

- If the system passes the tests of these four steps, proceed to the section called *Procedure for Cycling the System*, on the next page.

- If one or more of these tests have failed, go to the next step.

NOTE

Note the Frequency and Power values in the graph above.
You have the option of saving the test data for future reference.

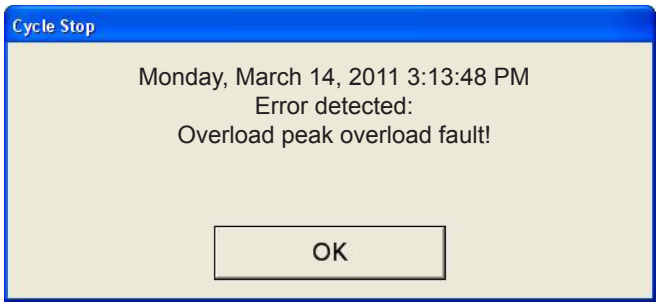

Figure 5-3 ***iQ*** Explorer Error Detected - Cycle Stop

Continued

Acoustic Stack Test *Continued from previous page*

5. Turn the generator off. Check the stack for proper assembly, damaged components, or dirty mating surfaces. Recheck the ultrasound cable for proper connections. Repeat Steps 1 through 4. If the test still fails, go to the next step.
6. Turn the generator off, remove the stack from the thruster, and remove the horn from the stack. Reinstall the transducer-booster assembly in the thruster and turn the generator on. Repeat Steps 2 through 4.

   If the assembly passes with the horn removed, the horn is outside the specifications required for operation with the Digi-Trac preset range. Reassemble the horn to the stack.

   The System tab of ***iQ Explorer*** has a section for Advanced Hardware. These features are designed for unique horns and applications. See Figure 5-4.

Consult Dukane Corporation before making adjustments to these settings.

   If any failure indications are present with the horn removed, check the booster and the transducer for the following
   - Any visible damage
   - Loose or cracked stud
   - Pitted or dirty mating surfaces

   Make any necessary repairs or adjustments.

   Go to Step 7.
7. Repeat Steps 1 through 6.
   - If the failure indications disappear, reassemble the horn to the stack and repeat Steps 2 through 4.
   - If any failure indications are still present, do not run this stack. Return the transducer and booster to Dukane for analysis.

NOTE

For more information about stacks, see this article: *www.dukane.com/us/SE_stackarticle.*

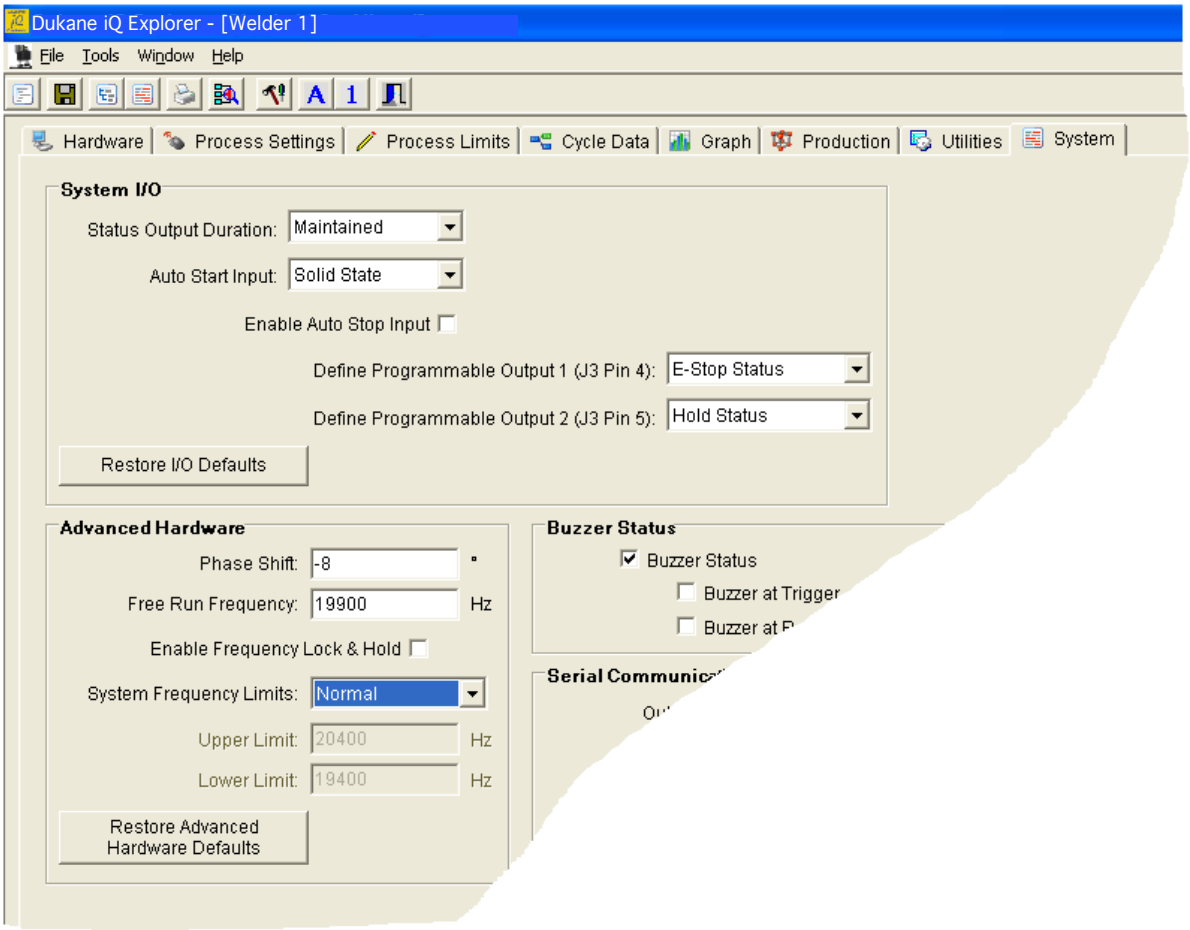

Figure 5-4 *iQ* Explorer System Tab - Advanced Hardware

Procedure for Cycling the System

1. Check that you have correctly performed the following:
   a. Installed the stack in the thruster and have closed the stack access cover securely.
   b. Secured the fixture in place.
   c. Performed the Operational Test of the Acoustic Stack as detailed on Page 74 of this section.
2. Verify that all controls on the Press/Thruster and the generator are set as required for this operation.
3. Place a part in the fixture.
4. Cycle the system.

   Activate both opti-touch switches at the same time to start the system, and hold fingers in place until the ultrasound starts. Releasing the fingers before ultrasound starts will abort the cycle.

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SECTION 6

Troubleshooting

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Troubleshooting

Problem	Possible Solution
Unit power-up sequence stops, and front panel ON/OFF button is flashing RED rapidly.	**Operation of the front panel ON/OFF button at power up**: • Steady Green - Generator is ready to cycle. • Red - Generator is in standby mode. • Slow Flashing Red - Generator is charging the internal power supplies. • Fast Flashing Red - AC line over/under voltage detected or internal power supply failure. -

NOTE

See the error message Tables for ***Servo*** and Pneumatic presses following this page.

NOTE

If troubleshooting does not provide satisfactory results, please contact Dukane Corporation (see *Section 9 - Contacting Dukane*) for servicing. The ***iQ*** ES generator and ***iQ Explorer*** are serviceable only by Dukane personnel. Unauthorized attempts to service either product will void any warranty.

Continued

iQ Servo Press Error Messages

Table 6 - I Error Messages, Servo-related

Error Message	Description	Cause(s)	Possible Solution(s)
Part detected before reaching start sensing distance.	Force in excess of 50 lb (220 N) was detected before reaching Sensing Start Distance.	1. Sensing Start Distance is too large. 2. Part(s) not properly loaded.	1. Decrease Sensing Start Distance. 2. Check part placement.
Press down travel limit exceeded!	Lower travel limit switch activated.	Press moved sufficiently far down to activate lower limit switch.	1. Lower bottom stop position. 2. Decrease weld or hold depth.
Servo actuator temperature limit exceeded!	Servo actuator is too hot.	1. Welder duty cycle is too large. 2. Weld/hold times or forces are too large. 3. Thruster fan not working. 4. Servo actuator or amplifier is damaged.	1. Reduce cycle rate. 2. Change setup to reduce weld/hold forces or decrease weld duration. 3. Check if fan is obstructed; contact DUKANE service for replacement. 4. Contact DUKANE service.
Error detected at servo press. OR Servo controller error!	One or more of servo-related error(s) has occurred. This message is accompanied by one of the following error types displayed in the Status area: Amplifier Error Checksum Error Command Error Down Travel Limit Force Duration Exceeded Position Error Servo Error Trigger < Sensing start Distance Up Travel Limit	See specific error type below.	See specific error type below.
Amplifier Error	Error occurred with servo amplifier.	Faulty wiring or damaged amplifier.	1. Restart press system. 2. Contact DUKANE service.
Checksum Error	Servo controller hardware error.	Problem with servo controller hardware.	1. Restart press system. 2. Contact DUKANE service.
Command Error	Servo controller program error.	Problem with servo controller hardware.	1. Restart press system. 2. Contact DUKANE service.
Down Travel Limit	Lower travel limit switch activated.	Press moved sufficiently far down to activate lower limit switch.	1. Lower bottom stop position. 2. Decrease weld/hold depth.
Force Duration Exceeded	While in Teach mode, time allowed for press to produce moderate/large forces was exceeded.	Moderate/large press force was being applied for an extended period of time, resulting in servo amplifier being automatically powered off.	Reduce force and/or amount of time force is applied while in Teach mode.

iQ Servo Press Error Messages

Table 6 - I Error Messages, Servo-related (*continued*)

Error Message	Description	Cause(s)	Possible Solution(s)
Position Error	Allowable servo position following error was exceeded.	1. Force required to maintain programmed speed(s) is too large. 2. Trigger Distance or Sensing Start Distance is too large, causing premature contact of horn with part. 3. Press motion is obstructed.	1a. Reduce weld/hold speed(s). 1b. Increase weld amplitude to increase melt rate. 2. Reduce Trigger Distance or Sensing start Distance. 3. Check for and remove any obstructions to press motion.
Servo Error	General servo error.	Multiple causes possible.	1. Restart press system. 2. Contact DUKANE service.
Trigger<Sensing Start Distance	Force or Power Trigger occurred before press reached Sensing Start Distance.	1. Sensing Start Distance is too large. 2. Part(s) not properly loaded.	1. Decrease Sensing Start Distance. 2. Check part placement.
Up Travel Limit	Lower travel limit switch activated.	Press moved sufficiently far up to activate upper limit switch.	Jog press down.
Up Travel Limit	Lower travel limit switch activated	Press moved sufficiently far up to activate upper limit switch.	Jog press down.
Overload (average) at xxx msecs. Power above generator rating.	Power from ultrasonic stack sent to the part exceeds power rating of generator.	1. Excessive pressure applied to the part. 2. Booster size is too large.	1. Decrease pressure applied to part. 2. Reduce size of booster.
Overload (peak) at xxx msecs. Check stack.		1. Component failure in the stack. 2. Improper stack assembly. 3. Incorrect Advanced Hardware settings.	1. Check functionality of stack components. 2. Disassemble and reassemble stack. 3. Check the generator's Advanced Hardware settings.
Over temperature fault!	Generator's internal temperature exceeds 158º F (70º Celsius).	1. Welder duty cycle is too large. 2. Weld/hold times or forces are too large. 3. Thruster fan not working. 4. Servo actuator or amplifier is damaged.	1. Reduce cycle rate. 2. Change setup to reduce weld/hold forces or decrease weld duration. 3. Check if fan is obstructed; contact DUKANE service for replacement. 4. Contact DUKANE service.
Overload (frequency) at xxx msecs. Check stack, cable or validate ramp up time.	Generator is unable to lock to the resonant frequency of the ultrasonic stack.	1. Improper stack assembly. 2. Defective ultrasound cable. 3. Ramp up time is too short.	1. Disassemble and reassemble stack. 2. Replace ultrasound cable. 3. Increase ramp up time.
Overload (frequency) at xxx msecs. Check for coupling between stack and part.	Generator correctly locks to the resonant frequency of the ultrasonic stack, but loses the lock at a point later in the weld cycle.	Horn comes in contact with the part nest or anvil.	Make adjustments to thruster and part nest.
Power fault. Check AC line.	AC line voltage drops below 190 VAC on 240 VAC systems, and below 95 VAC on 120 VAC systems.	Fluctuations in AC power.	Check the incoming AC line power.

iQ Pneumatic Press Error Messages

Table 6 - II Error Messages, Pneumatic-related

Error Message	Description	Cause(s)	Possible Solution(s)
Overload (average) at xxx msecs. Power above generator rating.	Power from ultrasonic stack sent to the part exceeds power rating of generator.	1. Excessive pressure applied to the part. 2. Booster size is too large.	1. Decrease pressure applied to part. 2. Reduce size of booster.
Overload (peak) at xxx msecs. Check stack.		1. Component failure in the stack. 2. Improper stack assembly. 3. Incorrect Advanced Hardware settings.	1. Check functionality of stack components. 2. Disassemble and reassemble stack. 3. Check the generator's Advanced Hardware settings.
Over temperature fault!	Generator's internal temperature exceeds 158º F (70º Celsius).	1. Welder duty cycle is too large. 2. Weld/hold times or forces are too large. 3. Thruster fan not working. 4. Servo actuator or amplifier is damaged.	1. Reduce cycle rate. 2. Change setup to reduce weld/hold forces or decrease weld duration. 3. Check if fan is obstructed; contact DUKANE service for replacement. 4. Contact DUKANE service.
Overload (frequency) at xxx msecs. Check stack, cable or validate ramp up time.	Generator is unable to lock to the resonant frequency of the ultrasonic stack.	1. Improper stack assembly. 2. Defective ultrasound cable. 3. Ramp up time is too short.	1. Disassemble and reassemble stack. 2. Replace ultrasound cable. 3. Increase ramp up time.
Overload (frequency) at xxx msecs. Check for coupling between stack and part.	Generator correctly locks to the resonant frequency of the ultrasonic stack, but loses the lock at a point later in the weld cycle.	Horn comes in contact with the part nest or anvil.	Make adjustments to thruster and part nest.
Power fault. Check AC line.	AC line voltage drops below 190 VAC on 240 VAC systems, and below 95 VAC on 120 VAC systems.	Fluctuations in AC power.	Check the incoming AC line power.

Verifying Feature Operation

The ***iQ*** ES generator can be configured with several features that provide interfaces from the control board to encoders and transducers outside the system. These features include the following:

- Distance Encoder
- Power
- EPR (electronic pressure regulator) with Pressure Transducer
- Force Transducer (Load Cell)

Each of these features has a corresponding output on the ***iQ Explorer***'s Cycle Data page. The Cycle Data page allows you to see the last cycle of a control/monitor parameter. In order for values to appear in the computer display, the system may have to be cycled or manipulated in some way.

Distance

To verify the distance feature, go to the Utilities page of ***iQ Explorer***. Put a check in the box (☐) for Monitor Encoder Position in order to view the encoder position.

To check encoder function, either remove air pressure from the press or depress the Emergency Stop switch that is grouped with the activation switches.

As the thruster head moves up or down, the displayed value changes. The value should increase as the head travels down and decrease as the head travels up. On power-up, the reference mark (distance value) internal to the ***iQ*** generator is set between - 0.03 inches to - 0.10 inches.

This means that only after the head passes the reference mark, will the distance data from the ***iQ*** generator be useful as it relates to the phases of the weld cycle.

Power

To verify operation of this feature perform an acoustic stack test.

If no power is displayed, contact Dukane.

Electronic Pressure Regulator and the Pressure Transducer

The electronic pressure regulator and pressure transducer are components of the same system. The electronic pressure regulator accepts commands from the ***iQ*** generator and sets the air pressure to the desired user-selected value. The pressure transducer senses the pressure and transmits it to the ***iQ*** generator via a 4-20mA current loop. To check the pressure components:

1) On the Process Settings page, verify that a Weld Pressure 1 setting has been made.
2) Go to the Process Limits page, and make sure the parameter, Contact Pressure has been set to be displayed
3) Cycle the machine. Then, go to the Cycle Data screen and see that the pressure reading is shown for the cycle just completed.

Force Transducer (Load Cell)

The force transducer senses force exerted on the part and controls when the ultrasound signal is applied. Check the force transducer by looking at the FORCE measurement on the View Parameters menu. The measurement should change when upward pressure is applied to the acoustic stack.

1) On the Process Settings page, select FORCE as the Trigger Type, and make sure Trigger Method is Normal.
2) Enter a FORCE value, perhaps 10 lbs for purposes of this check.
3) Go to the GRAPH page. Select an axis, and define it as FORCE.
4) Go to the GRAPH DISPLAY page.
5) Cycle the machine, then look at the graph to verify that the FORCE was at or near 10 lbs (the programmed FORCE setting).

CAUTION

Avoid injury when touching the acoustic stack! Wear proper hand protection, and grasp the acoustic stack in areas that are smooth or dull. Then, carefully apply upward pressure until a change in the Force measurement is seen on the ***iQ Explorer*** display.

Effects of I/O and System Errors on Process Flow

The welding cycle can be divided into a series of segments: Cycle Start, Downstroke, Trigger, Weld Pressure 1, Weld Pressure 2, and Hold. In each of these segments, operator action, rear panel inputs, and process limits can affect the flow of the process. What follows are examples of how some events can alter the flow of the welding process, and how they can be identified.

An Uninterrupted Cycle

Figure 6-1 shows the results of a weld process that was not interrupted by any I/O signal or system error. The setup conditions for this process were as follows:

- Normal Trigger
- Weld by Time for 50 ms.
- Hold by Time for 1.0 sec.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
35	0.975	1.7921	0.050	0.0023	28.4	1.000	2.025	1.8090
36	0.879	1.7927	0.050	0.0020	28.4	1.000	1.929	1.8092
37	0.877	1.7928	0.050	0.0022	28.4	1.000	1.927	1.8092

Figure 6-1 Data from an Uninterrupted Cycle

The Cycle Terminates During Downstroke

The system is in downstroke when the cycle has been successfully started and the head travels towards the part. If the cycle is terminated during downstroke, all trigger, weld, and hold characteristics are displayed as zeroes.

Figure 6-2 shows results of a cycle terminated during downstroke due to either an end of weld/ground detect error or a condition where activation switches were released before the trigger (there is no error code for this condition).

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
39	0.655	1.1959	0	0	0	0	0.655	1.1959
40	0.748	1.4229	0	0	0	0	0.748	1.4229
41	0.819	1.7946	0	0	0	0	0.819	1.7946

Figure 6-2 Cycle Terminated by I/O During Downstroke

Process limits can be set for all process segments including downstroke. Figure 6-3 shows the effect of a high bad part limit on Downstroke Time. In this example, the Downstroke Time was limited to 0.500 second. When the Downstroke Time reached 0.500 second, the cycle terminated and marked the part as Bad.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
12	>>0.500	0.3462	0	0	0	0	0.500	0.3462

Figure 6-3 Cycle Terminated by High Bad Limit During Downstroke

When using pre-trigger, part contact must occur within 0.75 inch after the application of ultrasound. If the weld is not complete or the trigger switch does not close within 0.75 inch from the start of pre-trigger, the cycle is aborted. Figure 6-4 shows cycles terminated for this reason. The pre-trigger distance was set at 1.000 inch. Note that the Downstroke Distance is 1.7527 inch for part number 56. This is equal to the 1.000 inch pre-trigger distance plus the 0.75 inch overtravel. The system can overshoot slightly due to thruster momentum.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
56	0.887	1.7527	0	0	0	0	0.887	1.7527
57	0.831	1.7522	0	0	0	0	0.831	1.7522
58	0.827	1.7516	0	0	0	0	0.827	1.7516

Figure 6-4 Cycle Terminated Due to Pre-trigger Overtravel

Premature Weld Termination

Weld Termination Due to End of Weld/Ground Detect

An End-of-Weld signal from the thruster limit switches and a Ground Detect signal to the J602 connector cause the Weld portion of the cycle to terminate. A characteristic of this type of weld termination is Hold Time. If the Hold portion of the cycle is executed, then the weld was terminated by an end of weld/ground detect error. Figure 6-5 illustrates this condition.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
55	0.882	1.7928	0.015	0.0006	6.5	1.000	1.897	1.8094

Figure 6-5 Weld Termination Due to End of Weld/Ground Detect

Weld Termination Due to Trigger Lost

If the trigger type is set to Maintained, loss of the trigger signal causes an immediate termination of the cycle when the ultrasound is applied. This results in a shortened weld and zeroes for both Hold Time and Hold Distance. Figure 6-6 shows a cycle terminated by a lost trigger input.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
55	0.882	1.7928	0.015	0.0006	6.5	0	1.897	1.8094

Figure 6-6 Weld Termination Due to Trigger Lost

Weld Termination Due to Secondary Control

Secondary controls are additional controls that allow the weld to be controlled by more than one process parameter. In this example, the weld portion of the cycle ends when either the primary control parameter (in this case, Weld by Time for 50 ms) or the secondary control parameter (Weld Energy for 20.0 joules) is reached. In either case, the cycle proceeds to the hold portion of the cycle provided that no process characteristics fall outside of the bad limits. Figure 6-7 shows the results using Weld Energy as a secondary control.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
3	0.999	1.7915	0.037	0.0024	20.3	1.000	2.036	1.8089
4	0.944	1.7919	0.038	0.0024	20.9	1.000	1.982	1.8089
5	0.906	1.7922	0.038	0.0021	20.9	1.000	1.944	1.8090

Figure 6-7 Weld Segment Terminated by a Secondary Control

Weld Termination Due to a Bad Limit

As with all bad part limits, falling outside of a limit results in an immediate termination of the process. Figure 6-8 illustrates the results when a bad part limit was exceeded for Weld Energy. The two "greater than" arrows (>>) preceding the Weld Energy measurement indicates that a bad part upper limit was exceeded. These arrows, known as *limit indicators*, are always displayed in the Cycle Data.

PART COUNT	DOWNSTROKE TIME	DOWNSTROKE DIST	WELD TIME PRESSURE 1	WELD DIST PRESSURE 1	WELD ENERGY PRESSURE 1	HOLD TIME	TOTAL CYCLE TIME	TOTAL STROKE
13	0.994	1.7916	0.038	0.0026	>>20.9	0	1.032	1.7942

Figure 6-8 Weld Segment Terminated by a Bad Part Limit

The *iQ* Generator Won't Cycle

Just before a weld cycle starts, the ***iQ*** generator waits for an initiating signal. If an initiating signal is applied and the system does not begin to cycle, check the following:

- Make sure the ***iQ*** generator's Initiate Mode in the Process Control menu is set to the appropriate setting:

  Manual if using activation switches; Auto if the system is configured for use with an automated system.

NOTE

The Initiate Mode selection must be set for each setup used. This is extremely important in the case of Sequencing and setup selection.

- Remove all inhibiting inputs and check that no Cycle Start error messages are displayed.
- Ensure that cabling is connected properly and that user interface circuitry is operating.

No Ultrasound

- To verify that the generator is producing an ultrasonic signal, use the acoustic stack test procedure described in ***Section 5, System Operational Testing***.
- Verify at the Utilities page, that the OFFLINE box is empty (not checked.)
- Verify pressure settings.
- Review the program. There should be a Weld Time P1 (and Weld Time P2 if dual pressure is used). Set the weld characteristic to Display in the ***iQ Explorer***'s Process Limits tab.
- Select Cycle Data, start the cycle, and view the reported Weld Time shown on the display. This tells that the controller has directed the generator to produce the ultrasonic signal for the programmed time.
- Verify that a time for the weld cycle is displayed.
- Verify that a value shows in Weld Peak Power, Method 1.

NOTE

If no value displays, there is a problem. For help, go to Contacting Dukane, Page 105.

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SECTION 7

Maintenance

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Front and Rear Panels

Cleaning

- Do not use any solvents or abrasive cleaners to clean any of the panels.
- Do not spray or apply cleaner directly on the generator.
- Apply a small amount of cleaner on a soft, clean cloth first. Then, clean the panel with the moistened cloth.

Power Button

The button responds well to firm, gentle finger pressure. Do not use sharply pointed tools or other objects that could damage the button.

Chassis

Sheet Metal Cover

The cover is preformed to fit over the chassis and has protective grills over the cooling air vents. Keep the cover on at all times because there are high voltages present which could cause injury. The internal case also contains capacitors which continue to hold a high electrical charge, even after the power is shut off.

Air Ventilation Slots

Keep the ventilation slots free from obstructions. If excessive dust or dirt collects on the slots, wipe or vacuum them clean. Do not use compressed air to clean them as this may force the dirt inside the chassis.

Allow 5 inches (127 mm) of clearance outside each ventilation slot.

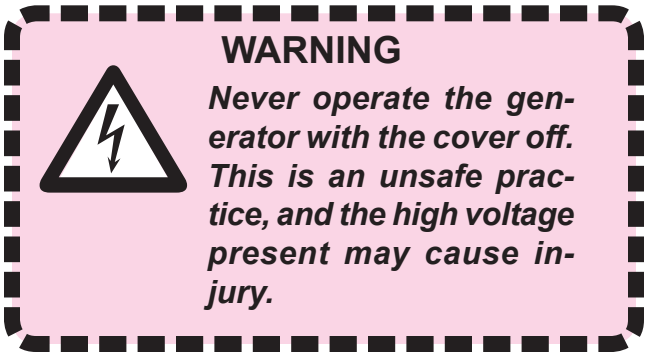
The air intake is on the right, and the exhaust is on the left. This is shown in Figure 3–3, Page 15.

I/O Connector

The Input/Output connector has a pair of 4-40 threaded jack screws to secure the connector. Make sure the screws are snug, but **do not overtighten them.**

AC Power Cord

The AC power cord should be kept in good condition and free from any cuts. The AC plug should be straight with no bent prongs.



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SECTION 8

Options

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This section of the User's Manual provides a general overview of some options/upgrades, all of which are subject to availability, for the basic ultrasonic generator:

Power Inlet Options

120V Systems for North America and Japan

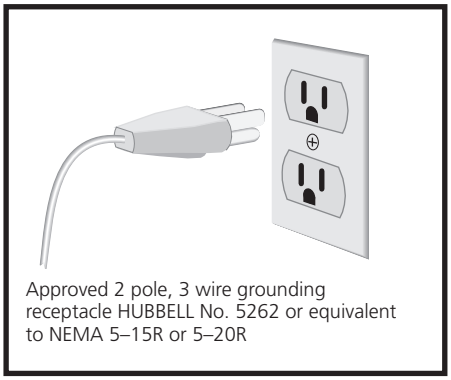
120V systems for North America and Japan have a fixed (non-detachable) power cord.

This option is available on generators with power ratings of 1200 watts or less and with operating frequencies of 20kHz, 30kHz, or 40kHz.

Electrical Safety

120V Power Ground

For safety, the power cords used on all Dukane products have a three-prong, grounding-type plug.



Approved 2 pole, 3 wire grounding receptacle HUBBELL No. 5262 or equivalent to NEMA 5–15R or 5–20R

Figure 8-1 Example of 120 Volt, Grounded, 3-Prong Receptacle

CAUTION

If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply.

CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

AC Power Inlet Panel

The optional AC power inlet panel is described here.

AC Power Cord

The AC power cord (Ⓐ in Figure 8-2) is appropriately rated and permanently mounted to the power inlet panel.

Power Switch/Circuit Breaker

The power switch/circuit breaker (Ⓑ in Figure 10-2) has a rocker type actuator switch that will activate or deactivate the AC power to the system. The power ON position is marked with the internationally recognized I symbol, the power OFF position is marked with the 0 symbol. This power switch also integrates an appropriately sized over-current protection circuit breaker function in the generator.

If an over-current condition trips the circuit breaker, it will automatically switch to the OFF position. If the overload current that caused the circuit breaker to trip is due to a transient condition, the circuit breaker can be reset by switching the actuator back to the ON position. If when resetting the circuit breaker after it has tripped, it immediately trips again, there is likely an internal system malfunction, and the generator will require service.

Do not repeatedly try to reset the circuit breaker. If it trips, this will only cause more damage to the generator.

Chassis Ground Stud

The chassis ground stud is used to attach a protective earth ground to the generator. This will aid in the suppression of electrical interference or radio frequency interference (RFI) that is common in an industrial environment. The chassis ground stud is Ⓒ in Figure 8-2. Proper system grounding is discussed on Page 9.

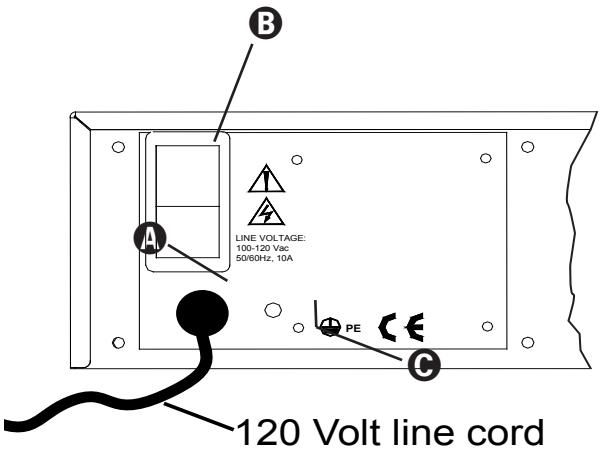


Figure 8-2 120VAC Power Inlet Panel

Press Interface Board

This board is also known as the Options Slot Board as shown in Figure 10-4, Interpreting the Model Number. Board location is shown in Figure 3-6.

Each option is described in general terms:

P4 - Dual Pressure Only P/N 110-4426

Dual pressure is a feature that is exclusive to Dukane press systems. It increases clamp force to improve the plastic melt and flow during the weld portion of a cycle and assures tight assembly during the hold portion by welding parts at one pressure and holding them together at a second, higher pressure. Dual pressure can also be used to begin a weld at one pressure, finish the weld at a second, higher pressure, then hold the assembly together at the second pressure.

P5 - Dual Pressure with Distance P/N 110-4427

Dual pressure is a feature that is exclusive to Dukane press systems. See the **P4** description above.

Weld by distance mode controls the melt collapse distance to ensure that the same volume of material melts on each part. The result: finished joint strength is consistent.

All distance parameters - downstroke, trigger delay, weld hold, absolute weld, total weld, and total stroke distance - are monitored to show upper and lower limits for bad and suspect parts. This will verify part quality and uniformity.

Dukane's linear optical encoder has a one-micron resolution to insure exceptional precision and repeatability.

P6 - EPR/Load Cell with Distance P/N 110-4428

This option offers programmable pressure profiling and force by interfacing with the EPR (electronic pressure regulator), pressure transducer, and load cell. Increased control, repeatability and consistency are benefits.

The electronic pressure regulator and pressure transducer are components of the same system. The electronic pressure regulator accepts commands from the generator and sets the air pressure to the user-selected value. The pressure transducer senses the pressure and transmits it to the generator via a 4-20 mA current loop.

The force transducer (load cell) senses force exerted on the part and controls when the ultrasound signal is applied.

See **P5** for more information on distance.

P7 - Servo Board P/N 110-4466

This board allows the generator to communicate with the ***iQ*** Servo press.

The Dukane ***iQ*** servo-driven welder is different from pneumatic systems. Instead of using pressure from an air cylinder, the servo welder uses an electrical servo actuator in place of the pneumatic cylinder. Instead of controlling the force, the servo system controls the speed of the horn during the weld and hold phases. Typical process control parameters are ultrasound amplitude, weld distance, weld speed (constant or profile), hold distance, hold speed, and static hold time.

Servo systems have taken parts assembly to higher levels of precision and repeatability.

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SECTION 9

Contacting Dukane

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Contacting Dukane

Identify Equipment

When contacting Dukane about a service–related problem, be prepared to give the following information:

- Model number, line voltage and serial number.
- Fault/error indicators from the ***iQ Explorer***.
- Software version.
- Problem description and steps taken to resolve it.

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 US

Phone: (630) 797–4900

E-mail: **ussales@dukane.com**

Fax:
Main (630) 797–4949

Service & Parts (630) 584–0796

Website

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature.

Here is the address for the main website:

www.dukane.com/us/

You can locate your local representative at:

www.dukane.com/us/sales/intsales.htm

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SECTION 10

Specifications

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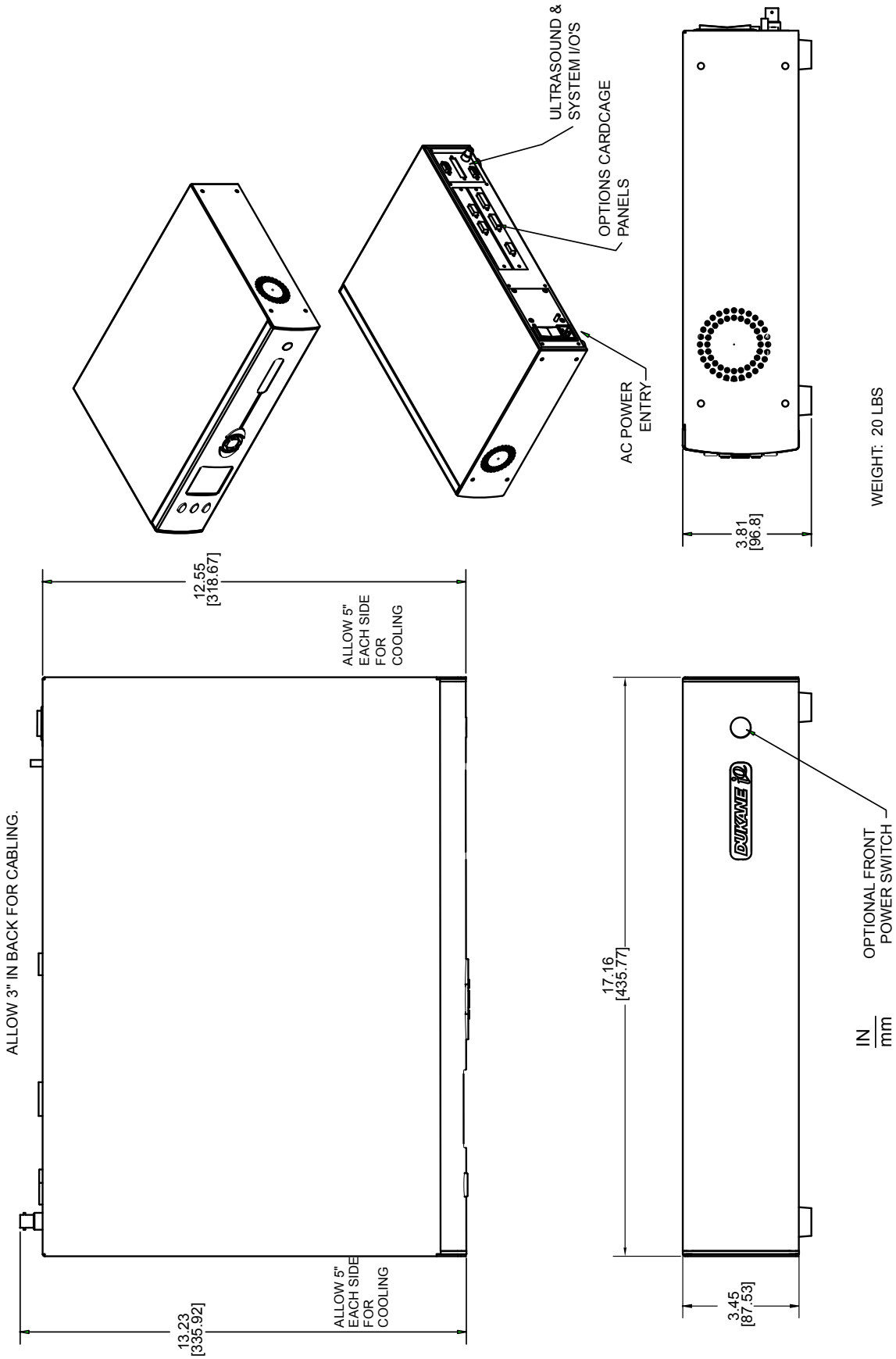

Figure 10-1 Layout - Low Profile *iQ* Generator

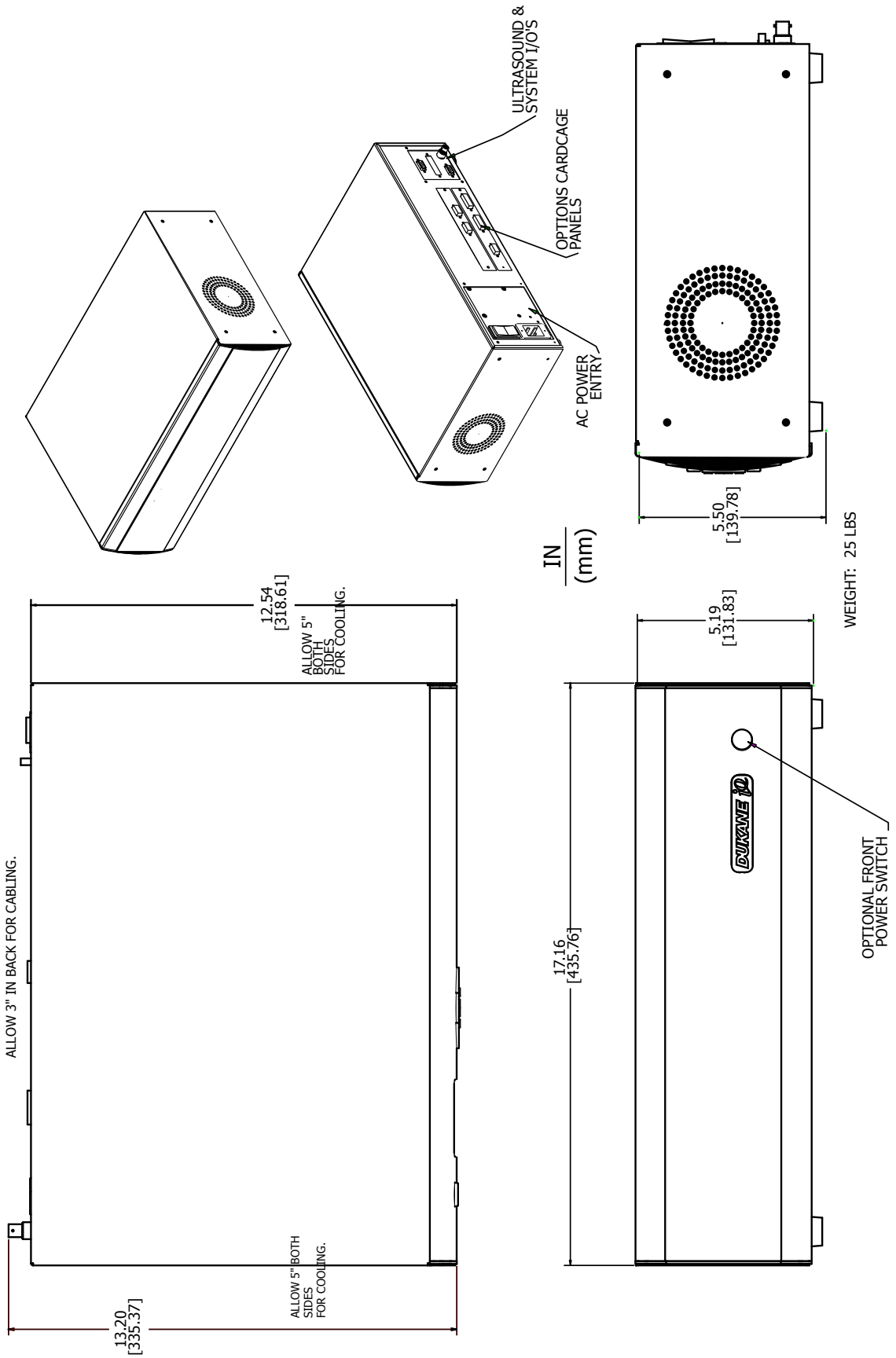

Figure 10-2 Layout - High Profile *iQ* Generator

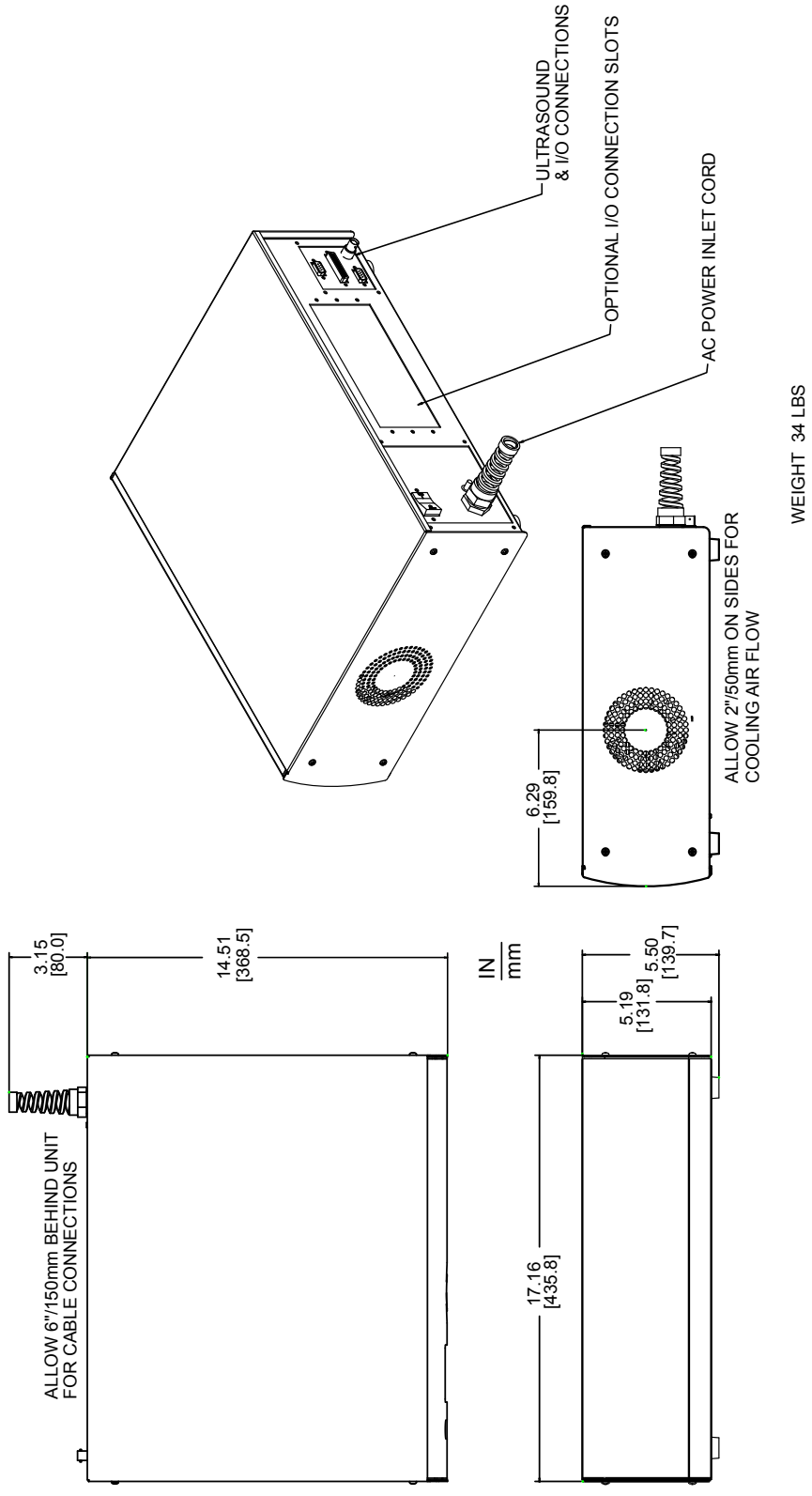

Figure 10-3 Layout - High Power *iQ* Generator

Weights

	High Profile		Low Profile		High Power	
	lb	kg	lb	kg	lb	kg
Generator Only	25	11.3	20	9.1	34	15.4
Generator + Packing Materials	30	13.6	25	11.3	39	17.7

Table 9–I *iQ* Generator Weights

Dimensions

Dimensions - in (mm)

Model	**Height ****	**Width**	**Depth**
Low Profile	3.45 (87.5)	17.16 (435.7)	12.55 (318.7)
High Profile	5.19 (131.8)	17.16 (435.7)	12.55 (318.7)
High Power	5.19 (131.8)	17.16 (435.7)	14.51 (368.5)

Table 10–II *iQ* Generator Dimensions

NOTE

** Add approximately 0.4" (10 mm) to height when the generator is equipped with factory installed feet.
Add between 3" and 6" (76 - 152 mm) behind the generator and 5" (1270 mm) for air flow and cable connections.

Operating Environment

Operate the equipment within these guidelines:

Temperature: 40°F to 100°F (+5°C to +38°C)

Air Particulates: Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

Humidity: 5% to 95% Non–condensing @ +5°C to +30°C

Nonoperating storage guidelines:

Temperature: -4°F to 158°F (-20°C to +70°C)

Air Particulates: Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

Humidity: 5% to 95% Non–condensing @ 0°C to +30°C

AC Power Requirements

Operating Frequency	Generator Model Number	Overload Power Ratings (Watts)	Input AC Power Requirements Nominal AC Volt @ Maximum RMS Current	North America/ Japan AC Outlet Rating
15kHz	15HS360-2A-XX-XX	3600	200-240V 50/60 Hz @ 25 Amps	30 Amps
15kHz	15HS480-2A-XX-XX	4800	200-240V 50/60 Hz @ 30 Amps	
20kHz	20HS120-1A-XX-XX	1200	100-120V 50/60 Hz @ 15 Amps	15 Amps
20kHz	20HS120-2A-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps	
20kHz	20HS180-2A-XX-XX	1800	200-240V 50/60 Hz @ 12 Amps	
20kHz	20HS240-2A-XX-XX	2400	200-240V 50/60 Hz @ 15 Amps	
20kHz	20HS360-2A-XX-XX	3600	200-240V 50/60 Hz @ 25 Amps	30 Amps
20kHz	20HS480-2A-XX-XX	4800	200-240V 50/60 Hz @ 30 Amps	
30kHz	30HS090-1A-XX-XX	900	100-120V 50/60 Hz @ 8 Amps	15 Amps
30kHz	30HS090-2A-XX-XX	900	200-240V 50/60 Hz @ 8 Amps	
30kHz	30HS120-1A-XX-XX	1200	100-120V 50/60 Hz @ 15 Amps	
30kHz	30HS120-2A-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps	
30kHz	30HS180-2A-XX-XX	1800	200-240V 50/60 Hz @ 12 Amps	
40kHz	40HS060-1A-XX-XX	600	100-120V 50/60 Hz @ 8 Amps	
40kHz	40HS060-2A-XX-XX	600	200-240V 50/60 Hz @ 5 Amps	
40kHz	40HS090-1A-XX-XX	900	100-120V 50/60 Hz @ 15 Amps	
40kHz	40HS090-2A-XX-XX	900	200-240V 50/60 Hz @ 8 Amps	
40kHz	40HS120-1A-XX-XX	1200	100-120V 50/60 Hz @ 15 Amps	
40kHz	40HS120-2A-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps	

Table 10-III AC Power Requirements

NOTES:

An X used above in the Model Numbers is a “wildcard” character meaning any valid character code combination.

Maximum line current requirement is specified at the minimum nominal AC line voltage and the rated power level.

Interpreting the Model Number

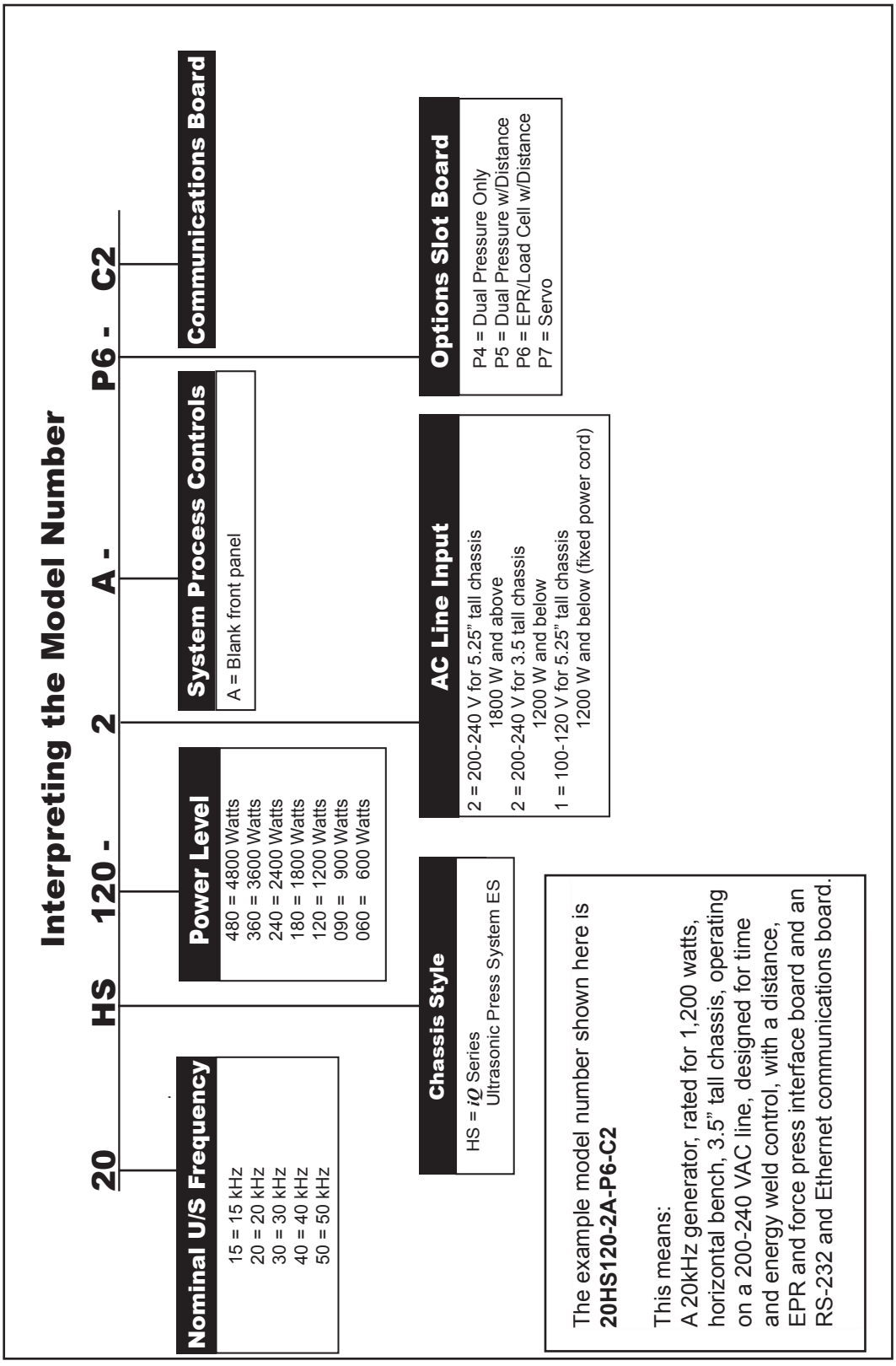

Figure 10-4 Interpreting the Model Number

Regulatory Agency Compliance

FCC

The generator complies with the following Federal Communications Commission regulations.

- The limits for FCC measurement procedure MP-5, "Methods of Measurement of Radio Noise Emissions from ISM Equipment", pursuant to FCC Title 47 Part 18 for Ultrasonic Equipment.

CE Marking

This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Europeéne (European Conformity). The equipment complies with the following CE requirements.

- The EMC Directive 2004/108/EC for Heavy Industrial —
  EN 61000-6-4: 2001
  EN 55011: 2003
  EN 61000-6-2: 2001
  EN61000–4–2
  EN61000–4–3
  EN61000–4–4
  EN61000–4–5
  EN61000–4–6
  EN61000–4–8
  EN61000–4–11
- The Low Voltage Directive 2006/95/EC.
- The Machinery Directive 2006/42/EC.
  EN 60204: 2006
  Safety of Machinery - Electrical Equipment of Machines Part 1: General Requirements.

CAUTION

DO NOT make any modifications to the generator or associated cables as the changes may result in violating one or more regulations under which this equipment is manufactured.

IP (International Protection) Rating

The ***iQ*** generator has an IP rating from the IEC (International Electrotechnical Commission).

The rating is IP2X, in compliance with finger-safe industry standards.

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SECTION 11
Appendices

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Appendix A List of Figures

Continued

Appendix A *Continued* List of Figures

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Appendix A *Continued* List of Figures

Appendix B

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Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001:2008 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well–defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane's status as a quality vendor of technology and products.

To achieve ISO 9001:2008 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001:2008 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection–oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane's quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

ISO 9001:2008
CERTIFIED

Dukane products are manufactured in ISO registered facilities.

Please refer to our website at:

www.dukane.com/us/sales/intsales.htm

to locate your local representative.

Dukane Intelligent Assembly Solutions • 2900 Dukane Drive • St. Charles, Illinois 60174 USA • TEL (630) 797-4900 • FAX (630) 797-4949